VOLUME 36
NUMBER 1

JANUARY, 1949

plating

BIG BUSINESS

See Contents Page 31

FOR PAINT ADHESION
ON ALUMINUM

FOR SPOT-WELD STRENGTH
OF ALUMINUM

for an attractive Satin Finish on Aluminum use Speedy

CLEPO SAT-N-DIP PROCESS

The Clepo SAT-N-DIP Process is an immersion process requiring no electric current and is very economical to operate.

If you would like more detailed information we will be glad to send you a copy of our Clepo SAT-N-DIP process booklet upon request.

FREDERICK **GUMM** *Chemical Company Inc.*

538 FOREST STREET KEARNY, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 1.

20 new ENTHONE products for better metal finishing

1 ALUMINUM BRIGHTENING COMPOUND 140 — A new process for chemically brightening and polishing of many aluminum alloys by simple immersion. Beautiful finishes are obtained in 30 seconds.

2 ALUMON — A process for preparing aluminum alloys for electroplating with all types of solutions. It is now being used by hundreds of manufacturers in the United States.

3 ACTANE — Promotes brighter nickel plating by removing colloidal agents left on the work following cleaning. Particularly effective for treatment of copper and brass prior to bright nickel plating.

4 ACID ADDITION AGENT — Reduces fuming in pickling by creating a foam blanket. Better wetting and more uniform pickling accomplished in both sulphuric and hydrochloric acid pickles.

5 BRASS CLEANER — A general purpose alkali cleaner for cleaning of all metals. Particularly suited for cleaning of copper, brass, Britannia metal, solder, tin and lead alloys.

6 ZINC CLEANER 20 — An anodic alkali cleaner for zinc base die castings to prepare them for electroplating. Insures the absence of blisters.

7 CLEANER 100 — A powerful highly detergent alkali cleaner for soak or electrolytic cleaning of steel.

8 ALUMINUM CLEANER "E" — An etching type aluminum cleaner that both cleans and etches the surface of aluminum alloys to produce finely etched uniform surfaces. Controlled foaming eliminates hydrogen spray.

9 EMULSION CLEANER 75 — A powerful new emulsifiable solvent cleaner safe for use in the plating room. Cleaner operates cold and removes oil, grease and buffing compound rapidly and economically.

10 EMULSION CLEANER 86 — An emulsifiable solvent cleaner used mixed with water for removal of solid dirt and buffing compound by means of agitation or in spray washing machines.

11 COMPOUND NR-37 — An addition agent to be added to a cold or hot water rinse to prevent rusting during drying of steel. Leaves no residual film.

12 WATER DISPLACING LIQUIDS — Water-shedding liquids to remove water films from metal to accomplish fast and stain-free drying.

13 INHIBITOR 9 — A new type of inhibitor for hydrochloric, sulphuric, hydrofluoric or other non-oxidizing acids. A complete inhibitor that is free-rinsing and leaves the metals bright.

14 EBONOL "C" — A patented process (U.S. Patent #2,364,993) for blackening and coloring copper and its alloys. Beautiful adherent deep black finishes are produced.

15 EBONOL "S" — A one-bath blackening process for iron and steel operating from 285-290°F.

16 EBONOL "Z" — A one-bath simple chemical process for blackening zinc plate and zinc alloys. Glossy attractive durable finishes are formed.

17 STRIPPER S-17 — A quick evaporating stripper used at room temperature for removal of many enamels, lacquers, varnishes and paints.

18 WIRE ENAMEL STRIPPER WS-72 — A thickened wire enamel stripper for removing enamel, "Formex" and "Formvar" coatings from wire.

19 STRIPPER S-300 — A powerful stripper for synthetic enamels that is used mixed with water both at room temperature and heated.

20 BLENDALL — An additive for nitrocellulose lacquers to give much higher gloss and flow-out to the coatings. Also is an excellent retarder to prevent blushing.

Paste this on a Post Card!

OR PIN TO YOUR LETTERHEAD

ENTHONE Bulletins

1	11
2	12
3	13
4	14
5	15
6	16
7	17
8	18
9	19
10	20

ENTHONE INC.
442 Elm St., New Haven, Conn.

Please send Literature checked ☐

Name _____ Title _____

Company _____

Products Manufactured _____

Address _____

City and State _____

Industry News

Titeflex, Inc., 500 Frelinghuysen Avenue, Newark 5, N. J., announces the appointment of **Manufacturers Sales Agency,** 523 Brushton Avenue, Pittsburgh 21, Pa., as exclusive sales agents for Titeflex products in Western Pennsylvania and West Virginia. The agency will sell the complete line of Titeflex products, including all-metal flexible tubing, industrial filters, high frequency leads, waveguides, and lubricator valves for central line lubrication.

Mr. Lewis Detch is manager of Manufacturers Sales Agency. Associated with him are N. Chrumbole, Herbert Jones, and Roy Evisset.

Binks Manufacturing Company, 3114 Carroll Avenue, Chicago, Ill., manufacturers of spray painting and water cooling equipment, has established a **Customer Service Department** which will serve to centralize all information and its dissemination, relieving other departments of details customarily handled by them.

To make Customer Service of greatest value to Binks customers, the department is answerable to no other department. Its staff collects all required information and answers requests promptly. Delivery promises, quotations, etc., are being checked daily to keep customers informed as to the progress of the work. The department is under the direction of Joseph Yokoun, who has been with Binks for twenty years.

Oakite Annual Technical-Sales Meetings. How recent developments in the field of cleaning and allied procedures are helping industry to combat rising production costs was the central theme of a series of technical-sales conferences held in New York, Chicago, and Kansas City during November by Oakite Products, Inc. Highlighted on the conference agenda were special reports delivered by Oakite research chemists, service engineers, and technical specialists on latest trends in cleaning and associated materials for the food processing, dairy products, metals, petroleum and railway transportation fields. Also discussed were new Oakite materials and equipment to be made available to industry during the coming year.

New Source of Perchlorethylene. Diamond Alkali Company recently announced its plans to manufacture perchlorethylene in facilities now rapidly nearing completion at its new Houston, Texas, plant. The operation will be allied to the company's electrolytic production of chlorine and caustic soda.

Perchlorethylene finds wide application in degreasing and cleaning of metals preparatory to electroplating, metal-cladding, and other surface-finishing operations.

New York Job Shop Platers. The Monthly Bulletin of the Masters' Electroplating Association for October reveals the interesting fact that rate of operations among its members is rising, from 53.0 per cent in September to 55.7 per cent in October. This is still, however, below the rate for October, 1947, which was 61.5 per cent.

An analysis of the operating profits during 1947 showed the surprising fact that the large job shops averaged a 3.2 per cent loss, while the medium-size shops showed a profit of 6.8 per cent and the small shops one of 3.4 per cent.

New Egyptian Lacquer Midwestern Plant. O. J. S. de Brun, President of the Egyptian Lacquer Manufacturing Company, has announced that construction of the company's midwestern plant has begun. It will be located in Lafayette, Ind., on the Cincinnati to Chicago highway (No. 52), about 120 miles south of Chicago and 60 miles north of Indianapolis.

Products will include the complete line of synthetic and lacquer industrial finishes and thinning materials now manufactured in Egyptian's Eastern Division in South Kearny, N. J.

The new Lafayette Division will have production equipment of advanced design and the entire plant has been carefully planned. Product development labora-

Published monthly at 5000 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Copyright, 1948, by the American Electroplaters' Society, Inc. Subscriptions Domestic and Canada, $4.00 per year, 50c per copy; Foreign, $6.00 per year, 75c per copy.

7 Reasons Why They're Putting PC-7 AIR DRY-RACK COATING ON THE LINE

a Natural that Resists CORROSION

Platers, everywhere, are putting their rack coating problems on the line . . . a heavy-duty barrier of PC-7 Insulation. Whether it's PATCHING or OVERALL protection, they are rapidly discovering the advantages of PC-7 . . . the perfect Air Dry Insulation that shaves material costs.

PC-7 quickly dries to a smooth flawless impregnable solid, forming a strong permanent bond with the rack that plating solutions can not penetrate.

PC-7 can solve your rack coating problems, too. Try it for your immediate PATCHING requirements and you'll soon be using PC-7 for the complete protection of every rack.

1 PC-7 ASSURES PROTECTION
The high solids content has been carefully blended with just enough solvents to make it compatible with most rack coatings (plastisols, rubber, air dry types). PC-7 is easily brushed over your present coatings for longer life, less maintenance . . . stellar performance.

2 PC-7 NEEDS NO BAKING
It dries quickly whether applied by brushing or dipping. No complicated techniques . . . ovens . . . or special equipment needed! Just remove metal deposits . . . rinse, dry and brush on a coat of PC-7. It air dries in an hour . . . ready for use.

3 PC-7 CUTS COSTS
PC-7 has over twice the coverage of most air dry coatings because of its high solids content. "Costs are cut in half and performance improved" say hundreds of platers who have switched to PC-7. Does a perfect patching job . . . brush right over present coatings. PC-7 repairs . . . protects and insulates perfectly.

4 PC-7 ADHERES
Adheres to metal and other coating materials like a leech . . . even boiling alkaline cleaners and chrome won't affect PC-7. Prove PC-7 yourself . . . cut away your present coating, where it has loosened at contact points, and brush on PC-7.

5 PC-7 RESISTS ATTACK
It thoroughly protects and resists all standard plating solutions . . . alkaline cleaners, acid pickling, etching and stripping baths. PC-7's outstanding performance has been proven under "on the job" surveillance for over a year.

6 PC-7 IS NON-CONTAMINATING
Leading purveyors of Bright Nickel have approved PC-7 for use in their solutions. Contamination is impossible with PC-7 because only the finest grade virgin materials are used in its compounding.

7 PC-7 IS A NATURAL
It is the natural solution to your rack coating troubles. Try a gallon. Brush it over your coated racks and see how PC-7 can reduce your cost and step up performance!

There's a MUNRAY Sales ENGINEER at Your Service

. . . With long experience in the electroplating field. He is trained to help you with your particular problems and can suggest ways and means that are sure to help you effect greater savings in your plating economy.

MUNRAY PRODUCTS, Inc.
Sales Division of The POLY-CYCLO PRODUCTS Co.
12400 CROSSBURN AVE. • CLEVELAND 11, OHIO

CUT BARREL DESCALING TIME UP TO 90% WITH MAGNUS D-SCALE-R

OPERATION

The operation is usually carried out in an open barrel, using 4-16 oz. of D-Scale-R per gal. of water, depending on the amount of scale or rust. Most scale can be removed in 15-30 minutes. Parts are usually examined at 5-10 minute intervals to observe the progress of descaling. When scale is all off, cold water is run into the barrel to overflowing, the solution is dumped and an alkaline cleaner (approximately 2 lbs. to a barrel) is added with water to fill, and the barrel run 5 minutes as a security measure to neutralize any remaining traces of D-Scale-R.

Write for complete information.

Save on Rejects, too!

Removal of heat treating scale and rust from steel parts by tumbling is a common enough practice, but often this operation is a costly bottleneck because of the time involved and the rejects due to the removal of too much metal.

Magnus D-Scale-R is an inhibited acid liquid cleaner widely used for descaling in barrels. It quickly attacks and dissolves rust and scale, but will not attack metals in the normal periods in which it is in contact with them.

Where descaling in tumbling barrels takes many hours, D-Scale-R usually does a better job in 15-30 minutes. In most cases, no stone chips or abrasives are needed eliminating the main cause of excessive removal of metal.

MAGNUS CHEMICAL COMPANY • 41 South Ave., Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., 4040 Rue Messen, Montreal 36, Que.

Service representatives in principal cities

USE READER SERVICE CARD: INDICATE A 4.

tories, sufficiently extensive to provide for independent treatment of the midwestern users' finishing problems, will be provided. Completion of the structure is planned for early 1949. The plant will be under the management of Mr. Nils Bolin.

The Metalwash Machinery Corporation has announced the opening of its new western office located at 1130 W. Olympic Boulevard, Los Angeles 15, Calif. Mr. J. Sigmund Berlie, who will be in charge of this office, has had many years of experience in the metal working industries, especially in washing and pickling of metal parts, and is available for consultation and information regarding all types of metal washing, pickling, drying, and processing machinery. He may be contacted by mail or by telephoning Prospect 5600.

Michigan Abrasive Company recently moved its complete fabricating facilities and general offices into two new buildings at 2360 W. Jefferson Avenue, Detroit, Mich. "We are doing six times

more business today than five years ago," Max C. Jones, Michigan Abrasive president, explained. "We had to find additional plants to take care of present and prospective volume. All of our fabricating operations are installed in the new plants. These fabricating facilities include new high capacity ovens for manufacturing resin-bonded industrial abrasives. And this added equipment means that our entire industrial line of abrasives now has the toughness that only our Red-Coated resin bond can give."

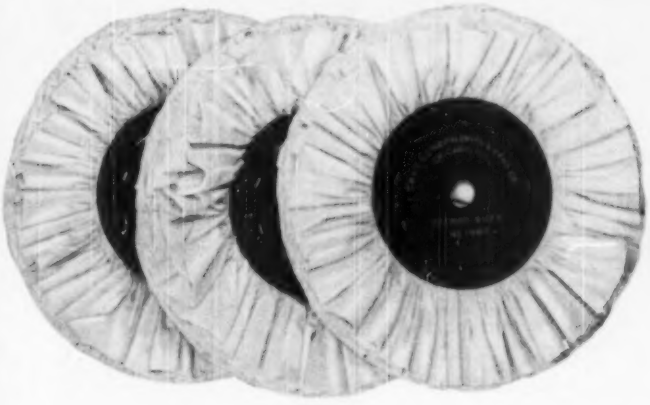
The company's executive and general offices were also moved to the new quarters. All abrasive making equipment and operations will continue in the Company's old plant at 1111 Bellevue Avenue.

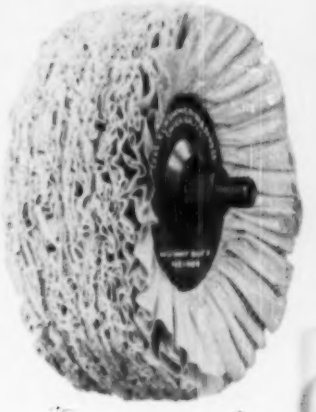
Formal opening of the new plants was celebrated October 29 with an Open House where customers and friends inspected the new equipment between refreshments, dinner and entertainment.

Norton Company recently announced changes in its **Abrasive Division** sales force.

A. W. Cox, formerly abrasive engineer in the St. Louis area, has been shifted to a newly established territory in southern California. E. H. Styffe, abrasive engineer, moves from Pittsburgh to take over Mr. Cox's responsibility in St. Louis.

RELIANCE PRODUCTS



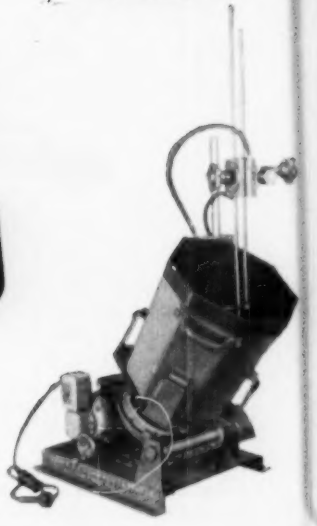


NUWAY BUFFS

MANY FOLDS TO HOLD COMPOSITION USED FOR FAST CUTTING, FLAT AND ROUND SURFACE WORK.

EXTRUDED COMPOSITIONS

MORE COMPACT, NO LOSS FROM BREAKAGE MORE ECONOMICAL.



RELIANCE MIDGET PLATING BARREL

TUB CAN BE LIFTED OUT FOR DUMPING AND TUMBLING BARREL INSERTED FOR TUMBLING INSTEAD OF PLATING—VERY RIGID—THREE SPEEDS.

USE READER SERVICE CARD; INDICATE A 5.

Chas. F. L'Hommedieu & Sons Co.

MANUFACTURERS of

Plating and Polishing Machinery

Complete Plating Plants Installed

C. B. Little
Newark, N. J.

W. R. Shields
Detroit, Mich.

O. M. Shoe
Philadelphia, Pa.

Gen. Offices and Factory:
4521 Ogden Ave.

CHICAGO

Branches:
Cleveland
and
Los Angeles

for cleaning parts
to be chrome-plated

USE WYANDOTTE NO. 90

Wyandotte No. 90 is a high-conductivity, reverse current electrocleaner with remarkably good tolerance to chrome contamination. It removes smut and fabricating compounds from ferrous parts efficiently and thoroughly, thus helping to assure bright, cloud-free electroplates.

No. 90 is especially valuable in automatic equipment where parts are not reracked before going into chrome plating. Wyandotte No. 90 solutions tend to eliminate plating difficulties caused by the drag-over of trapped chrome-plating solution.

Other advantages of this heavy-duty cleaner are its controlled foaming and long life in solution. Special ingredients in No. 90 condition the water in the cleaning bath and improve rinsing action.

No matter what your metal-cleaning problems may be, you'll find the answers in the complete Wyandotte line. For detailed information, simply call your nearest Wyandotte Representative.

Wyandotte
REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 6.

Industry News

Charles H. Krume, formerly field engineer in Connecticut, has been appointed abrasive engineer and will cover the territory vacated by Mr. Styffe in Pittsburgh.

Thirteen Wyandotte Representatives Get 25-Year Watch Awards. The Wyandotte Representatives shown here recently received gold watches to commemorate twenty-five years of service to users of cleaning and processing materials.

Front Row, left to right: L. B. Horne, Boston; G. D. Caffrey, New York; W. R. Jones, Manager of Food and Beverage Department, Wyandotte; Carter B. Robinson, Vice-President—Sales, J. B. Ford Division, who completed 25 years in 1942; F. A. Kilpatrick, San Francisco; and C. R. Beaubien, Detroit. Second Row: B. J. Rosenthal, Minneapolis; P. B. Johnson, Kansas City; A. A. Bettner, Milwaukee; Tom Blair, Wyandotte; M. W. Millard, Toronto; J. A. Trozell, Dayton; and B. B. Baker, Portland. Absent when photo was taken: B. B. Cosgrove, Fort Wayne

Electrostatic Detearing and Spray Finishing is now described in a 16-mm technicolor sound film put out by Ransburg Electro-Coating Corporation, 1234 Barth Avenue, Indianapolis 7, Ind. This film is available to technical societies, educational groups, manufacturers, etc., at no charge.

A special sequence shows how each process works, especially the paint-saving electrostatic spray process. The major part shows actual production painting of representative parts in the plants of Delta Electric Company, Marion, Ohio (bicycle lamps and flashlights), Stratton-Terstage Company, Louisville, Ky. (fishing tackle boxes), Martin-Parry Corporation, Toledo, Ohio (metal office partitions), Alside, Inc., Akron, Ohio (aluminum lap siding), Ironrite Ironer Company, Mt. Clemens, Mich. (automatic iron parts), The Brearley Company, Rockford, Ill. (bathroom scales), J. I. Case Company, Bettendorf, Iowa (farm implement parts), Hotstream Heater Company, Cleveland, Ohio (water heater parts), Eaton Manufacturing Company, Cleveland, Ohio (automobile heaters), Wheeling Steel

Transfer Acids FASTER & SAFER *with* BELKE Carboy Acid Pumps

Avoid tiresome, time-wasting manual pumping.

Prevent acid burns caused by the dangerous "blurping" that splashes acid as it pours from tilted carboys.

Eliminate time wasted in tilting slow-pouring carboys. Pumps approximately 2 gallons per minute.

Reduce carboy breakage.

The Belke Electric Carboy Acid Pump weighs only 11 pounds. Merely slip it into the carboy. The self-sealing rubber connection fits like a cork, automatically sealing the carboy neck. When the motor switch is turned on, the electric pump builds up air pressure in the carboy, quickly forcing the acid out thru the tube in an even, easy-to-manage stream.

Pressing "Flow Stop" Lever instantly stops flow of acid by releasing air pressure in carboy. Pressure Release Valve prevents air pressure from going above 30 lbs.

Only the easily removable tubing, thru which the acid flows, comes in contact with acid and acid fumes. The tubing is available in lead, hard rubber and Saran.

Write or ask a Belke Service Engineer.

Used for Transferring

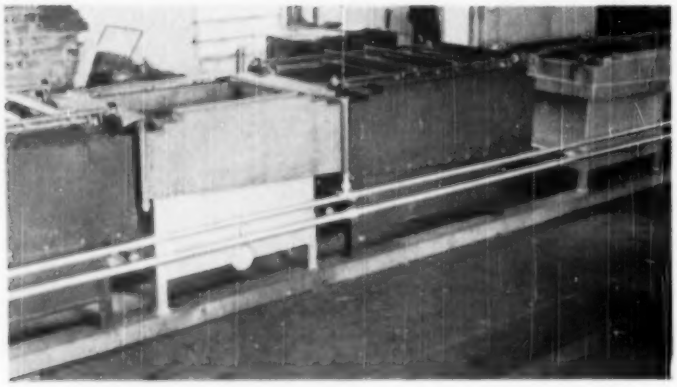
Nitric Acid	Hydrofluoric Acid	Vinegar
Muriatic Acid	Phosphoric Acid	Ammonia
Citric Acid	Chlorine Bleaches	Glycerine
Sulphuric Acid	Formaldehyde	Peroxide
Acetic Acid	Carbon Bisulphide	And Many
Formic Acid	Aluminum Chloride	Other Liquids

Belke MANUFACTURING CO

947 North Cicero Ave. Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

Pointers on Planning Plating Tank Cycles for Long Life



Plan to check corrosion at every point

Be sure that for every corrosive agent along the line you have specified a material that has proved to be a sure and satisfactory safeguard against rapid deterioration.

The section of a Stortsdesigned and Stortswelded plating tank cycle shown above is a good example of positive corrosion defense. The first and third tanks are rubber lined to contain acid solutions at moderate temperatures. Between them is a lead lined tank for a hot acid solution. The unlined tank at the right is satisfactory for a hot alkali solution. Each material is used when and where it will do the most good.

Provide adequate exhaust systems

Proper drafting facilities protect adjoining plant equipment from corrosive attack when correctly designed and made corrosion resistant.

Tanks are well set up for good air circulation. Up-blast ventilation from each tank with individual fans. For complete corrosion protection, exhaust casings are lined and covered similarly to the tanks which they serve.

Design accessories for easy maintenance

Pipe lines, valves, etc., should be located for accessibility without encumbering the normal operation of the equipment. Good layout will facilitate preventive maintenance.

Steam and water pipes are installed under exhaust casing side extensions for ease of inspection and protective painting. The absence of overhead encumbrances often caused by supply lines makes for improved operation. General design provides for proper alignment and uniform working height.

We shall be glad to quote on your present needs.

STORTS WELDING COMPANY
INCORPORATED
42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specifications

Industry News

Corporation, Wheeling, W. Va. (oil cooling of tin plate); Norge Division, Borg-Warner Corporation, Muskegon Heights, Mich. (refrigerators).

H-VW-M New Electroplating Laboratory in Matawan, N. J., described in this issue, was opened with a short but impressive ceremony on November 17, with Hanson-Van Winkle-Munning Company's president, Mr. Louis M. Hague, as Master of Ceremonies.

Mr. Van Winkle Todd, Chairman of the Board, delivered the dedicatory address and Mr. Myron B. Diggin, the company's Technical Director, accepted the laboratory on behalf of the personnel. Congratulatory addresses by Congressman Hon. James C. Auchincloss and A. E. S. President Mr. S. S. Johnston closed the formal proceedings.

The opening began with guided tours through the establishment at which the reasons for the arrangements and the functions of the various departments were explained in detail.

It closed with a cocktail hour.

Among the hundreds of distinguished visitors were Dr. W. Blum, Chief, Electrodeposition Section, National Bureau of Standards; Thomas F. Slattery, Director, Bureau of Engraving and Printing; Dr. D. T. Ewing, Department of Chemical Engineering, University of Michigan; Dr. R. M. Burns, Chemical Director, Bell Telephone Laboratories, Murray Hill, N. J.; Major General G. L. Van Deusen, (U. S. A. Retired), R. C. A. Institute, New York City; Mr. Carl E. Heussner, Materials Engineer, Chrysler Corporation; K. M. Huston, Senior Research Chemist, Armco Steel Corporation; Dr. Richard M. Wick, Research Engineer, Bethlehem Steel Company; Captain A. G. Shepard, U. S. N., Commanding Officer, Naval Ammunition Depot, Earle, N. J.; Edwin D. Bransome, President, Vanadium Corporation of America; F. W. Godsey, Jr., Manager, Westinghouse Electric Corporation; and Dr. A. Kenneth Graham, A. E. S. Executive Secretary.

Experienced man who knows plating field and can talk buffing composition, etc. Excellent opportunity for Northern Indiana, Ohio and Southern Michigan with leading midwest manufacturer. Supply all details in writing.

BOX P-1A, PLATING
P. O. Box 168, Jenkintown, Pa.

SILVER PLATER WANTED

Silver plater with executive ability to take charge of new department. National organization in Ohio. Give full details, experience, salary expected. *Reply to:*

P-1B, PLATING
P. O. Box 168, Jenkintown, Pa.

ALUMINUM CLEANING MADE EASY

COWLES TECHNICAL SERVICE ON REQUEST

Your Cowles Technical Man is especially qualified to render service on all cleaning problems on aluminum and its alloys.

When you use Cowles Aluminum Cleaners you reduce your cleaning problems to a minimum.

Cowles A E Cleaner is a low pH cleaner with synthetic emulsifying and wetting agents designed for both still tank and electrocleaning of aluminum. It is fast-acting and free rinsing. It is economical to use because of its long life in solution. Cowles A E Cleaner is non-etching—will not attack the aluminum at high concentrations and high temperatures.

Cowles 352 Cleaner is especially designed for pressure type and other standard type washing machines. It incorporates all of the desirable characteristics of A E Cleaner but *will not foam.*

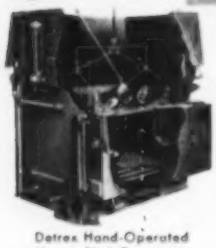
PROMPT SHIPMENTS FROM LOCAL STOCKS

Cowles Chemical Company

FORMERLY THE COWLES DETERGENT COMPANY

METAL CLEANER DEPARTMENT • CLEVELAND 3, OHIO

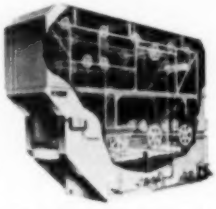
You'll SAVE on EVERY Metal-Cleaning Job with DETREX Machines and Cleaning Agents



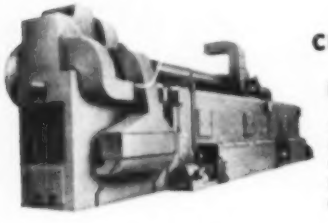
Detrex Hand-Operated Vapor-Slush Degreaser

DETREX builds all sizes of hand-operated and conveyorized degreasers and washers for parts of every shape and size from needles to auto bodies—castings, forgings, tubing, wire and stampings—ferrous, non-ferrous and mixed loads — in any volume desired.

For most jobs, *standard* Detrex machines provide top speed and economy, either used "as is" or with minor modifications. For the really unusual jobs, special machines are designed and built to assure the same top efficiency.



Three-Dip Detrex Degreaser with Cross-Rod Conveyor



Conveyorized Detrex Multi-Stage Washer with Three Spray Zones and Blowoff

DETREX SPECIALIZED CLEANING AGENTS Include:

DEGREASING SOLVENTS for

★ ***Both ferrous and non-ferrous metals, and adverse operating conditions*** —PERM-A-CLOR, the most highly stabilized of all trichlorethylene solvents.

★ ***Average applications*** —TRIAD, identical to Perm-A-Clor in cleaning power.

ALKALI and EMULSION CLEANERS for

★ ***Aluminum*** parts and ***painted surfaces.***

★ ***Brass, aluminum*** and ***white metal*** parts.

★ ***Heavy-duty*** cleaning of ***iron, steel*** and their alloys.

★ Cleaning and neutralizing prior to ***vitreous enameling.***

★ ***Electrolytic cleaning*** especially for plating.

★ ***Heavy-duty stripping*** of pigmented oil paints, synthetics, and baked enamels.

★ ***Removing all kinds of oils and insoluble dirt,*** without attack on surface or coating.

Detrex machines and cleaning agents, *fitted to the job,* assure fast and thorough cleaning at lowest cost. That's why it pays to see your Detrex man on *every* metal-cleaning application.

DETREX Corporation
DETROIT 32, MICHIGAN
DEGREASING MACHINES AND SAFETY SOLVENTS • METAL PARTS WASHERS • ALKALI AND EMULSION CLEANERS AND STRIPPERS • PROCESSING EQUIPMENT • SPRAY BOOTH COMPOUNDS

Personals

Walter L. Shephard, Jr., who recently accepted a position as Technical Adviser to Tanks & Linings, Ltd., Town Wharf, Droitwich, Worcestershire, sailed for England on October 8. He was formerly Advertising Manager with The Atlas Mineral Products Company of Pennsylvania, Mertztown, Pa.

Dr. H. P. Munger, for nineteen years associated with the steel industry in product development and production work, has joined the staff of Battelle Memorial Institute, Columbus, Ohio. At Battelle he will be engaged in research in chemical engineering.

Dr. Munger received his Bachelor of Science degree in chemical engineering from the Georgia School of Technology, his Master of Arts degree from Columbia University, and his doctorate from the University of Pittsburgh. He has been successively connected with the Mellon Institute, American Rolling Mills Company, Republic Steel Corporation, Van der Horst Corporation, and the Youngstown Sheet and Tube Company. He is probably best known for his development and production work on electroplated sheet and strip steel.

The new Battelle appointee is a member of the American Iron and Steel Institute, the Association of Iron and Steel Engineers, the American Electroplaters' Society, and Phi Kappa Phi, Alpha Chi Sigma, and Phi Lambda Upsilon honor societies. He is the author of several technical papers on the chemical processing of steel strip.

Henry Gifford has joined the Heavy Chemical Sales Division of Mathieson Chemical Corporation with headquarters in Chattanooga, and will cover Tennessee and adjoining states. A native of South Carolina, Mr. Gifford received his B.S. degree from Clemson A.&M. College in 1935. Since then he has been affiliated with the chemical industry, particularly nitrogen fertilizer materials, and during the early part of World War II was employed by the Atmospheric Nitrogen Corporation. Prior to joining Mathieson, Mr. Gifford was on the sales staff of Allied Chemical and Dye Corporation.

Garrett C. Van de Riet has been appointed Controller of the Detrex Corporation, Detroit 32, Michigan.

Mr. Van de Riet has been with Detrex for the past six years in its Industrial Equipment, Dry Cleaning, Oil Extraction, and Solvent Divisions. Coming originally from Grand Rapids, Mich., where he was graduated from Calvin College with a

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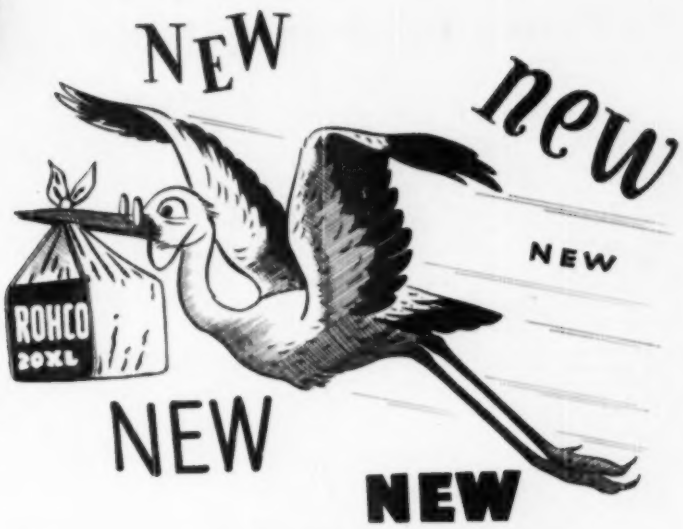
NEW



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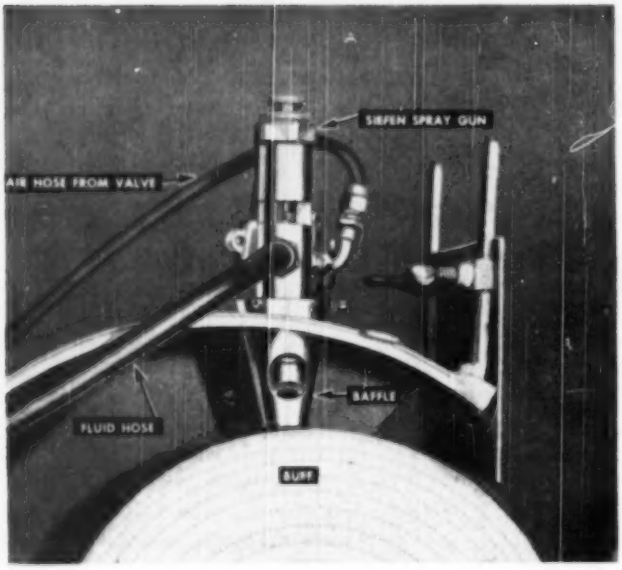

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Personals

Bachelor of Arts degree in Economics, he received his Master's degree in Business Administration from the University of Michigan in 1936. He taught at the University of Detroit, was associated with Parke-Davis Company, and the Treasurers Division of the General Motors Corporation, before joining Detrex.

John S. Cort, Jr., is now assistant to the president of Martin Dennis Co. of Newark and Kearny, N. J. The company, a subsidiary of Diamond Alkali Company, Cleveland, Ohio, manufactures chromium chemicals.

Associated since early 1947 with the Cincinnati, Ohio, plant operated by Diamond's Standard Silicate Division, Cort succeeds **Charles E. Grant,** who was promoted September 1 to the position of manager of chromium chemical sales for Diamond Alkali at Cleveland and transferred at that time to the company's general head quarters there.

A native of Dormont, Pa., Cort graduated from the University of Michigan in 1935 with a B.S. degree in chemical engineering. He has since been associated in various technical and supervisory capacities with Pennsylvania Salt Manufacturing Company; Garco Products, Inc., Ford City, Pa.; Houdry Process Corporation, Paulsboro, N. J.; and Diakel Corporation, Cincinnati, Ohio.

Richard F. Tomlinson, who joined Antara Products, a division of General Aniline & Film Corp., two and a half years ago as assistant to the Advertising Manager, has been appointed Advertising Manager of the division. He is a Babson graduate and served in the Army Air Forces during the World War II. His offices are at 444 Madison Avenue, New York City.

First promotional efforts under the new policy of direct sale to industry only, will feature the Antaroxes, which belong to the chemical family of aromatic and aliphatic polyglycol esters and ethers and have many industrial applications as detergents, wetting agents and emulsifiers.

Hyman Iserson and **Maurice E. Miville** have been appointed research chemists at the Whitemarsh Research Laboratories of Pennsylvania Salt Mfg. Co., according to Dr. W. A. LaLande, Jr., Director of Research and Development.

Mr. Iserson, a native of New York City, attended New York public schools. He received his bachelor of science degree at the College of the City of New York and his master's degree at Temple University. He has worked as a research chemist for Frankford Arsenal and for Rohm and Haas.

Mr. Miville was born in New Hampshire and was educated in Merrimack, N. H., public schools and the University of New

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- **FOR BONDING PAINT TO GALVANIZED IRON** — "Lithoform" (phosphate coating chemical).
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Personals

Hampshire where he received his Bachelor of Science degree in chemistry. A veteran of World War II, he served with the Army in Europe. He formerly was employed by the Celanese Corporation of America.

Faulman

L. D. Faulman, who recently was appointed manager of the Imperial Plating Rack Company of Flint, Mich., is a graduate of the Michigan State College with a B.S. degree. Before joining the National Rack Company of Fair Lawn, N.J. as sales manager he served with the electronics division of the Michigan Bell Telephone Co.

Keyes

Jack Keyes has been appointed to handle sales and service to plating and metal finishing industries in Detroit, Southern and Western Michigan, and Ohio for Wagner Brothers, Inc., Detroit, Mich. Mr. Keyes brings to this field thirteen years of practical experience in plating and polishing as superintendent in some of the larger plants in the Middle West and, in the past eight years, as sales representative for Hanson-Van Winkle-Munning Company.

OBITUARIES

†**Lawrence J. Morper** passed away on October 12. He was Vice-President and Secretary of Crown Rheostat and Supply Company of Chicago.

†**Hubert M. Rosenerans,** 59, assistant director of sales of the Grasselli Chemicals Department of the duPont Company, died Thanksgiving night at the University of Pennsylvania Hospital in Philadelphia, having suffered a stroke while attending the Penn-Cornell game at Franklin Field. He was a resident of Springfield, Pa.

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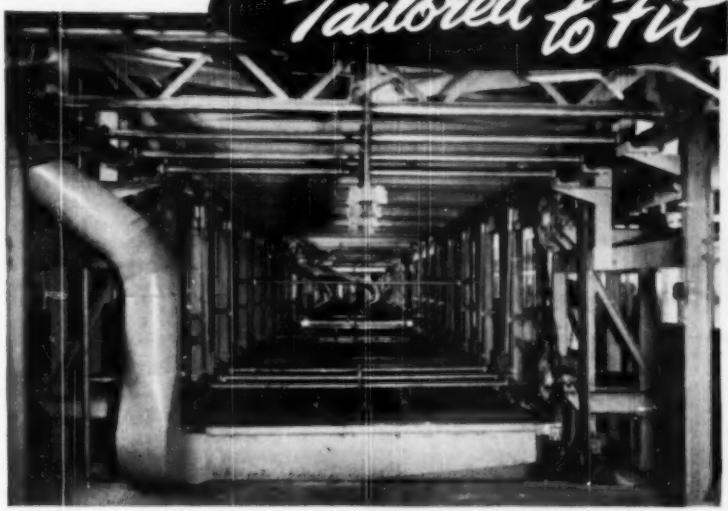
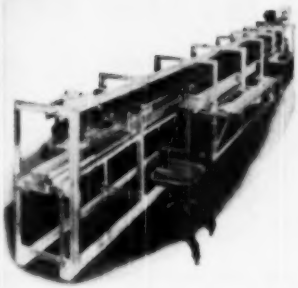


Typical Meaker Straight-A-Way Automatic Machine. This machine was built for copperplating three rows of work simultaneously. It handles 125 racks per hour that are 16 inches wide, 14 inches thick, and 70 inches long.



Meaker Special Machine designed for cleaning and silver plating small, brass contact clips. The unit is loaded at one point and the parts are carried through the operating sequence and automatically discharged into a container when completed.

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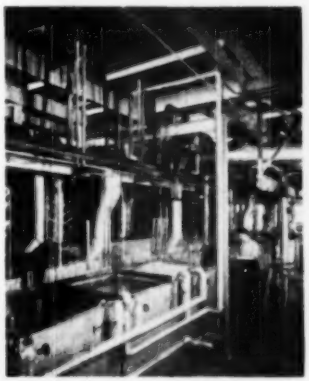
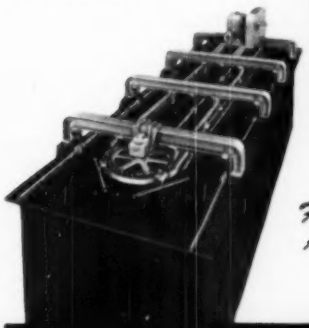


A Meaker Semi-Automatic Machine for use in medium-output plating departments. This type equipment is used in large, job plating plants to supplement the capacity of automatic machines.



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The Mailbox

Subject: Dr. Read's Review on "Electrolytic Polishing and Bright Plating of Metals".

DEAR SIR:

Dr. Read should not be unaware of the difficulties involved in collecting reliable and accurate information on the processes which are employed today. Considerable laboratory work has, for example, been carried out in the electrolytic polishing fields, and this has largely crystallized in the filing of innumerable patents, ranging from those which record legitimate bona fide advances to those which it may be suspected have been filed for tactical reasons.

Anybody setting out to write a review of the facts is at once up against the difficulty of assessing what Dr. Read rightly calls the "copious literature" on its face value and a danger of making statements in all good faith to which one or other of the numerous patentees or authors may take strong exception. This is particularly the case in that some of the claims made are, as it were, still "sub judice". The would-be author has necessarily to tread a wary path and can only call on his own experience in assessing what is to be discarded or worthy of inclusion. The result when set down in black and white may easily appear to show lack of balance, but in the present state of development in these new fields, this is practically inevitable.

In the bright plating sphere, the same problem faces one, except that it is accentuated by the fact that there is a fundamental difference in attempting to assess European and American contributions—especially in the all-important field of bright nickel plating. British practice is largely based on the cobalt-nickel electrolyte, about the composition of which there is no secret, and there is therefore little difficulty in entering into a full discussion on this process. American practice is largely based on a number of proprietary formulae of the sulfonate type, the composition of each of which is a closed book. During the recent visit to a number of large American plating plants, I was greatly struck by the closeness with which the secrecy of these solution compositions had been maintained. The nature of various additions were unknown and only speculated upon by the technical executives, who (probably rightly) considered that, provided the proprietary house marketing the process also fully maintained them, it relieved them of so much responsibility. The only way to obtain any authentic information on American bright nickel processes has been through the patent files, which Dr. Read

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complains were consulted in describing American practice. The mass of patents is colossal and it was necessary to reduce the available material considerably to present it within reasonable confines. In what way does the reviewer suggest a more judicial selection can be made of vast quantities of material the real value of which is so enshrouded in secrecy?

It may of course be suggested that to attempt to write a book on the subject in the present condition of affairs is to have been too precipitate. Any work which is produced having regard to the above background is bound to be open to all sorts of criticism. My object in writing the book has been to try to set on record some of the highlights in the present situation and not to write a textbook. As the first book on the subject, it is bound to be deficient in some respects, of which the author is only too conscious, and for similar reasons the book does not merit the vitriolic attack made on it by Dr. Read.

Taking up the reviewer's criticism now in detail, he first expresses disappointment at the absence of any considerable section on theory. No conscious effort has been made to theorize but the principles of electrolytic polishing are enunciated and the theory underlying the reduction of crystal size and production of bright deposits are dealt with in sufficient detail where called for (e. g., the chapters on bright nickel, bright zinc and cadmium, bright silver).

It may possibly be considered that the space devoted is inadequate (although I do not think so), but surely some more appropriate adjective than "worthless" might have been applied to what has been written, since Dr. Read can hardly disagree with the substance of the statements made.

On the practical side, Dr. Read states there are "numerous passages where questionable procedures are recommended" and then contents himself with quoting copper plating practice as an undercoating to nickel, as described in the book. The reviewer has been unfortunate in his selection here, because the author has had extensive experience of working this particular copper electrolyte under the conditions enumerated and has been able to maintain the conditions and produce admirable deposits as an undercoating for bright nickel. Dr. Read's suggestion that a lower anode current density be employed has been tried with this electrolyte, but the objection to this procedure is that the rate of copper solution tends to become too excessive and results in a high build-up of metal content, with the consequent necessity that the solution has to be discarded at an early stage.

Incidentally, the reviewer seems to have forgotten his reference to this copper electrolyte when he states that the only reference to a copper cyanide solution is the Schlotter bath, although he is on firmer ground when he points out that the well-known cyanide electrolytes are not treated in either the copper or the cadmium sections. The explanation of this omission is that, as indicated in the preface, the book is largely based on a series of articles and the sections dealing with copper and cadmium were mainly concerned with novel (rather than orthodox) electrolytes of the acid type.

It is somewhat difficult for the author to envisage what it was Dr. Read expected to find in a pioneer work on the subject under discussion. He says that he propounded two hypothetical problems on electrolytic polishing and could not find the answers in the book. One is left guessing what these particular problems were, but surely this is not meant as serious criticism? One can take any accepted standard work, e. g., that of Blum and Hogaboom in the United States, or Field and Weil in Great Britain, and propound half a dozen problems without getting any practical enlightenment, and these undoubtedly admirable books have the advantage that they are concerned with processes which are fully established. The author is not familiar with Dr. Read's own work, but would he be prepared to test the comprehensiveness of anything he has written by such means?

That Dr. Read's review is hypercritical is also evidenced by his grudging reference to the extensive bibliography which appears in the book and which, as may be appreciated, represents a not inconsiderable amount of work in itself. He has pointed out two errors (one of them obviously typographical) in a list of 529 en-

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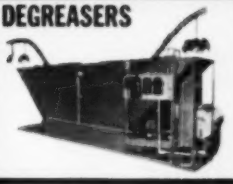

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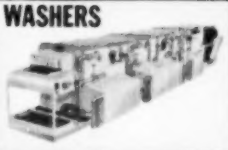

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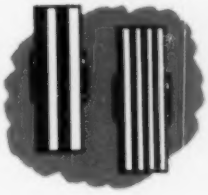

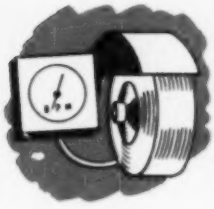

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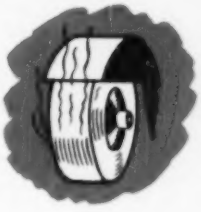

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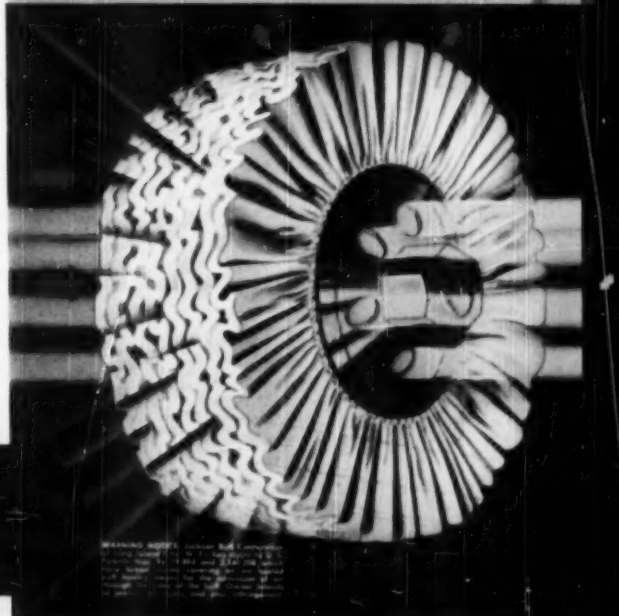

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The Mailbox

tries, and also indicated that some papers have been omitted. The two errors noted are at least constructive criticism, or be it somewhat carping, so one must express gratitude for the service.

Finally, Dr. Read states the book cannot be recommended to practical platers, development engineers or research men. The only comment thus far received by the author from American sources on the book has come from the director of a large bumper plating plant in the Middle West, incorporating the most impressive electropolishing installation inspected during the recent visit to the States. His entirely complimentary remarks lead me to believe that the work is finding a sphere of usefulness after all.

S. Wernick.

A copy of Dr. Wernick's comments were sent to Dr. Read. His reply follows:

Dear Sir:

I appreciate the opportunity to comment on Dr. Wernick's letter, but I am content to let my review stand. I see no reason to modify anything which I said therein.

Yours truly,
Harold J. Read.

●

Subject: Correction

Dear Sir:

With respect to the paper by Read and Thompson entitled "Effect of Internal Stress on Thickness Determinations by the Jet Method" which appeared in the September, 1948 issue of Plating, I wish to draw attention to errors which resulted from changes in the manuscript after it left my hands. These changes were made without my knowledge or approval.

1. The legend for the ordinate axis of Fig. 3 should read "Deviation of Jet Test Results from Microscopic Measurements in Ten Thousandths of an Inch".

2. The second sentence of the second paragraph in the third column on page 924 should refer to "fine structure" instead of "fineness of structure".

Yours very truly,
Harold J. Read.

●

Subject: Copper in Silver-strike Deposits

Dear Sir:

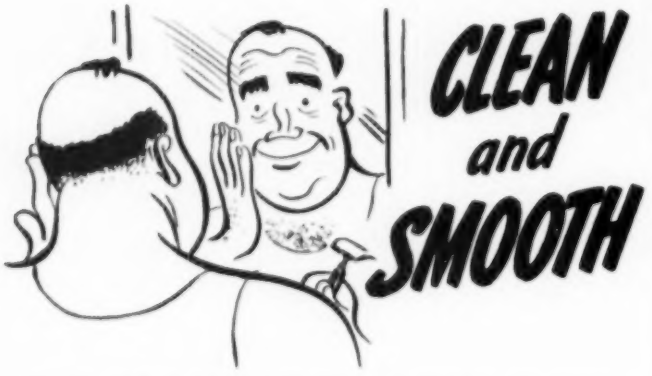
Your note on page 1140 of the November, 1948 issue of Plating to the effect that "the common copper-containing silver strike deposits pure silver", raises an important question.

The RCA-Victor Tube Works (radio tubes) and the Ken-Rad Tube and Lamp Corporation of this city have plated 100,000 "headers" per day using the strike formula on page 335 of the 1930 edition of Blum and Hogaboom, "Principles of Electroplating and Electroforming". The thin barrel plated silver deposits are analyzed at frequent intervals and the analyses show a non-varying copper content of 0.7 to 0.8 per cent, using the starch-iodide and thiosulfate method with sodium fluoride to minimize the ferric iron effect. The deposits are certainly not pure silver. Adhesion is excellent—the deposits stand 180° bending at all times and no blisters are evident on heating at 850° C in hydrogen atmosphere. The steel is aluminum "killed".

Very truly yours,
Robert C. Matlock.

(Formerly Chief Chemist, Ken-Rad Tube and Lamp Corporation, now Owner, Owensboro Plating Company, Owensboro, Ky.)

Since Mr. George B. Hogaboom was the authority for the statement in question, a copy of this letter was submitted to him. He kindly replied as follows:



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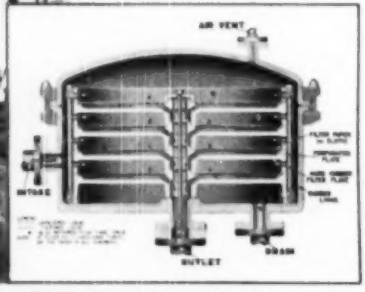

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Yours truly,
GEORGE B. HOGABOOM

Correction

In the second line of the second paragraph of the December Editorial the word "distinctive" appears instead of "destructive". We regret this printer's error which made the sentence unintelligible.

Langbein Desired

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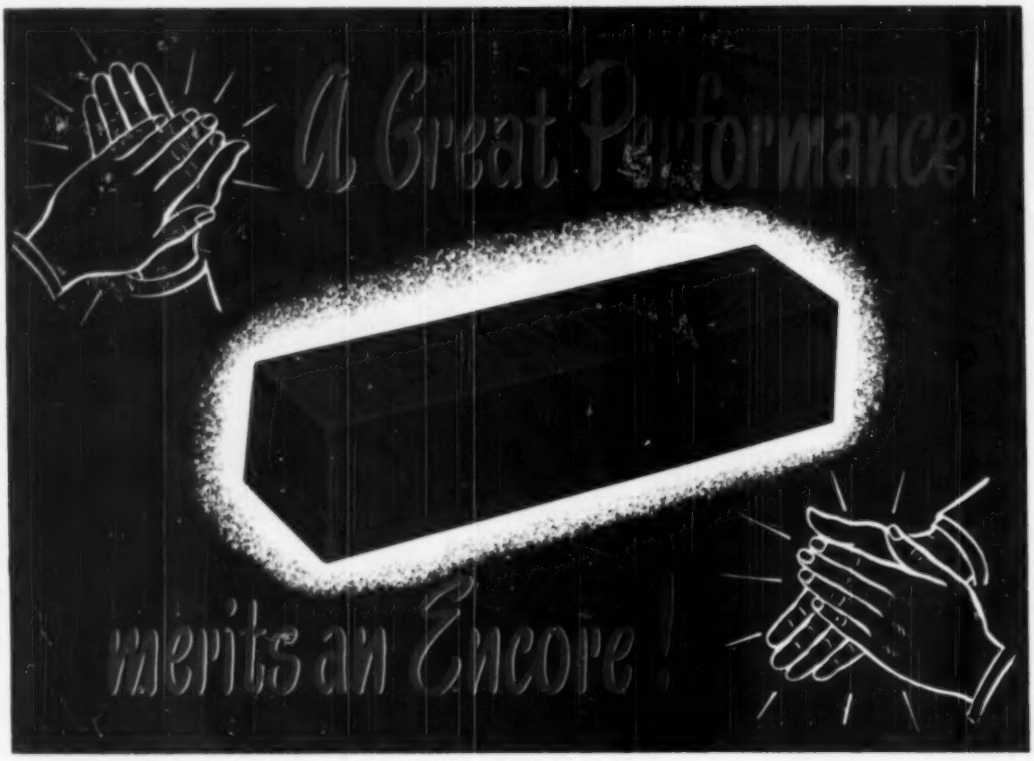

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plating

VOLUME 36 NUMBER 1

Contents for January 1949

Maintenance in the Plating Room 34
R. B. Saltonstall

A Modern Electroplating Laboratory 38
M. B. Diggin

Deposition of Precious Metal Alloys. II and III. 47
A. K. Graham, S. Heiman and H. L. Pinkerton

Big Business 50

An Incentive Plan for Job Shop Plating 56
Paul E. Miller

The Effect of Impurities and Purification of Electroplating Solutions: A. E. S. Research Project No. 5 58
D. T. Ewing and W. D. Gordon

Monthly Features

Industry News 4
Personals 12
Editor's Mailbox 18
Editorial 33
Leaders in the Industry 46
Question Box 63
Book Review 65
Article Abstracts 66
Patent Abstracts 74
Equipment and Supplies 80
Trade Literature 86
A. E. S. News 91
Branch News 92
Membership Report 97
A. E. S. Directory 99
Advertising Index 103
Letter from the Editor 104
Future Meetings 104

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Editorial

The trend in decorative plating

UNTIL RELATIVELY few years ago the cost of decorative plating was largely the cost of polishing the base metal and buffing the coating. A very large part of recent development in this field has had for its purpose the reduction of the cost of these operations. One needs only to cite improvements in the base metals used in forming the article, such as finer and more uniform grain size; chromium plating of forming dies; introduction of automatic polishing and buffing machinery, belt polishing, simplified polishing cycles, and improved methods of finishing by tumbling to recognize the changes that have been wrought in polishing. Similarly, the development of more easily buffed deposits and bright deposits have greatly reduced or even eliminated buffing costs.

Recently several additional means have been brought to the attention of the plater. They include electropolishing, both of base metal and deposit, and plating processes which produce coatings that are smoother than the underlying surface by means of periodic-reverse current or very special addition agents in the solutions. There is also evidence that anodic pickling, at current densities less than electropolishing current densities, may have a substantial levelling effect. The researches into these phenomena have been greatly facilitated by the use of devices which measure surface roughness, originated in the machinery field.

Judging from the present status of these developments and their as yet limited applications, one can easily see that much work remains to be done. The apparently ultimate goal, complete elimination of buffing and relegation of polishing to the role of correcting accidental imperfections in the base metal and production of special finishes, is still a long way off.

The suppliers of polishing and buffing equipment and supplies, recognizing this trend, can do much to stave off what now seems to be a rather bleak future. Cutting metal by abrasives is not very well understood today. It would seem that a great deal of cost reduction could be accomplished if more were known about the relationship between base metal properties and polishing techniques. The tool industry has done a great deal of pioneering work along this line, some of which should be directly applicable to polishing and stimulate further work.

Gustaf Soderberg

Dr. Richard B. Saltonstall, born in Cheboygan, Mich., on January 17, 1906, received his B.S. degree from Olivet College in 1927, his M.S. degree from Michigan State College in 1931, and his Ph.D. degree from the same school in 1935, specializing in electrochemistry and physics. During the interval, 1927–1930, he taught high school chemistry in Charlotte, Mich. He joined The Udylite Corporation in 1936 and served first as Research Chemist and later as Service Manager. In 1943, he succeeded the present editor of this journal to the post of Technical Director which he now holds. He is very active in the affairs of the Detroit Branch of the American Electroplaters' Society and an Associate Editor of PLATING.

MAINTENANCE IN THE PLATING ROOM

By R. B. SALTONSTALL

The Udylite Corporation, Detroit, Michigan

MAINTENANCE OF EQUIPMENT in plating departments is too often sadly neglected. This is especially true in smaller shops. Many large plating establishments have a regular maintenance staff and program for inspection and reconditioning of equipment and facilities. However, in most plating rooms, some production time is lost and life of expensive equipment is shortened by lack of attention and repair at necessary intervals.

Maintenance is especially important in the plating shop because of the nature of the operations performed and the corrosive conditions encountered. Careless oiling and greasing of automatic equipment, for example, can be very harmful to the operation of processing solutions.

In order to attack this subject in an orderly manner, it may be well to discuss briefly the important factors in the maintenance of various types of equipment and facilities.

Tanks

All plating and processing tanks hold solutions of varying corrosiveness. Acid solutions are usually held in lined steel or wooden tanks, while alkaline solutions are commonly kept in unlined steel tanks since they do not attack steel appreciably except under unusual conditions. Lined steel tanks should be emptied occasionally and the linings inspected carefully for *breaks*. A small hole in a rubber or synthetic lining, if not repaired, may lead to a hole in the steel tank, necessitating expensive repairs and possibly causing loss of valuable solution. *Blisters* between the lining and tank sides or bottom may indicate faulty temperature controls since overheating is usually the cause of blistered linings. If metal begins to deposit on a tank lining because of a break and is not removed or stopped off, it may spread over a considerable area, causing damage to the lining and loss of metal and current.

All tanks holding processing solutions other than rinse water should be inspected regularly for *leaks* by observation of both the appearance of the outside of the tanks and undue lowering of solution levels. Rejects are more expensive than lost production, and if a plating tank shows signs of leaking, the solution should be either analyzed or tested by plating a few pieces before the tank is loaded with work. Leaks are especially likely to escape notice temporarily if automatic level devices are used to add water or dragout liquid to the solution.

Opinions differ regarding the advisability of *painting* outside surfaces of tanks; it certainly protects them against corrosive attack and improves the general appearance of the plating room.

Since plating room floors are usually wet with water and electrolytes, it is highly important that all tanks be *insulated* from the floor. Nonabsorbent insulating materials, such as glass brick, are preferred. Rubber, plastics and other materials may also be used. Unless specially treated, wood is not satisfactory as it tends to absorb solutions and become a conductor.

Electrical Equipment

Motors.—Electric motors, used for many purposes in the plating room, vary in the frequency with which they need be *oiled*. Generally speaking, sleeve-bearing motors should be oiled not less than once a month, and ball-bearing motors not less than once in six months. This minimum schedule may be qualified by the location of the motor: alkaline fumes or spray tend

to shorten the life of the oil appreciably, and if exposed to such conditions, the motors must be oiled more frequently than normal. Over-oiling is harmful, and it is much better to add a small quantity of oil rather frequently than to add large quantities at less frequent intervals.

The principal cause of motor failure is *overloading*. It is better to have the motor too big for the job than too small. If not of the totally enclosed type, motors should be protected against *drippage* and *spray* by the use of appropriate baffles or shields. Care should be taken not to shut off the *air circulation* through the motor, or overheating and failure may result.

Generators, Exciters and Controls.—The principal parts of these items requiring maintenance are the bearings, the brushes, and the commutators.

Manufacturers' instructions regarding *lubrication* should be preserved and followed. Brushes should be inspected regularly for *wear* and replaced before there is danger of the brush holders scoring the commutator. Replacement brushes should be purchased from the generator manufacturer or his representative to make sure they are the correct type. Commutator life may be lengthened by judicious use of a commutator dresser or stone. Occasionally, it may be necessary to undercut the mica between the commutator segments; this should be done only by one with experience.

Most motors, exciters, and generators are direct-coupled. If the *bolts* which hold the units to the base become loose, alignment may be destroyed and vibration and damaged bearings result. The hold-down bolt should therefore be checked occasionally for tightness.

The principal visible difficulty is excessive *sparking* between the brushes and commutator. The usual causes are (1) dirty or rough commutator, (2) overload, or (3) brushes out of position. Only an experienced electrician should attempt to change the position of the brushes.

Finally, generators should be kept *clean* and away from corrosive fumes and spray. Many shops find it desirable to house generators in a separate room. This is excellent practice providing the bus work from the generators to the tanks does not become so long as to cause serious power losses.

Rectifiers and Controls.—Perhaps the two most important maintenance items for this equipment are *ventilation* and *cleanliness*. The former is somewhat dependent on the latter, since regular blowing out of the bridges, transformers, and screens with compressed air is necessary to keep dust from interfering with the normal flow of air. The air path must be kept clear, and unclogged by boxes piled around or on the rectifier.

The *overload* protection supplied with the equipment must be used to avoid failure caused by overloads. If the starter kicks out, something is wrong and should be corrected before the machine is put back into operation.

Because rectifiers are ventilated by motor-driven fans, heavy corrosive fumes or spray will be sucked into the transformer and bridges. Precautions must therefore be taken to keep the rectifier away from such fumes or spray.

The voltage regulators which are supplied with many rectifiers need no special attention aside from occasional blowing out of dust. Like rectifiers and other electrical equipment, they should not be subjected to baths in alkali or acid spray.

Rheostats.—If not subjected to overloads, rheostats will last a long time without maintenance. Their function is to dissipate electrical energy as heat; since most of them depend on "chimney action" for cooling, they must be kept open at top and bottom. Switch contacts should be checked occasionally, and individual switches and resistors should not be overloaded.

Meters and Shunts.—The most common cause of meter failure is burning out by *short circuits*. This applies principally to ammeters, since voltmeters are usually of sufficient capacity to handle the maximum voltage possible in the circuit.

A common difficulty with meters is *corrosion* of the leads and lead contacts. Poor contact between ammeter leads and the shunt or the meter, and leads of high resistance can cause serious errors. Generally speaking, meters will operate satisfactorily for years if not damaged. All meters should be checked occasionally for accuracy against a standard meter. Ammeter shunts should be blown out with air at intervals to prevent an accumulation of *dust and dirt* which may clog the shunt and cause overheating.

Electrical Conductors.—This item includes bus bars, flexible cables, anode and cathode rods and, in fact, any metal part whose function it is to carry low-voltage direct current.

Most of the difficulties occur at *joints*. Fumes and moisture penetrate between contact surfaces and cause corrosion which increases the resistance of the electrical connection. *Bolts* are loosened by vibration. A number of poor connections in a long bus bar may cause serious power loss. Bus bars are frequently tinned at joints; this is good practice because tin becomes oxidized less readily than copper. Flexible cables which conduct current to moving work rods may break in time because of the continued *flexing*, and the bolts which connect them to stationary or moving conductors are especially likely to become loose.

Observation of any *heating* and the *voltage drop* are the two best methods for checking electrical connections. If a joint is appreciably warmer to the touch than a remote section of the bus bar, a faulty contact is indicated. The voltage drop across the joint while current is flowing should be negligible; an appreciable voltage drop indicates a poor connection.

Anode rods, anode hooks, work rods and rack hooks are all subject to splashing with solutions and *encrustations* of salts. These should be washed off frequently. Do *not* use emery cloth or sandpaper in such a way that the fine particles of abrasive and of copper re-

moved by the abrasive fall into plating solutions.

Sliding contacts will be discussed under the heading of automatic conveyor machines.

Mechanical Equipment

Automatic Conveyor Machines.—Proper *lubrication* at sufficiently frequent intervals is the principal maintenance requirement of both semi- and full-automatic conveyor machines. Moving parts including drives should be greased lightly with a high-surface-tension grease which does not emulsify easily in plating solutions containing wetting agents. One such grease is Type CL, manufactured by Crystal Lubricants. This is satisfactory for both chains and sliding contacts and has surprisingly little effect on a bright nickel solution, even when introduced in appreciable quantity.

If automatic equipment is hydraulically operated, be sure that water is kept out of the *hydraulic oil* tank and that the oil level is kept up. "Bouncing" of the hydraulic mechanism indicates air in the system, which should be allowed to escape through the vent provided for that purpose.

Electric brakes, widely used on full automatics, require *adjustment* about every six months.

Superstructure and tanks should be kept *painted* to protect them from rusting. Be sure to cover plating and processing solutions while painting the machine, especially if the paint is applied by spraying.

Tank Rod Agitators.—Gear reducer mechanisms, roller bearings, and crank bearings should be oiled lightly and frequently. Chunks of dirty oil or grease which collect unavoidably should be carefully removed.

Hoists.—Lubrication is the foremost maintenance item. Hooks and controls on electrical hoists should be well *insulated* to prevent stray currents to racks and possible electrical shocks to operators. Air hoists should be matched for *oil drippage*.

Plating Barrels.—Few pieces of equipment in the plating shop must withstand the abuse to which the average plating barrel is subjected. The execution of a well-planned program of barrel maintenance will not only prolong the life of the equipment but will also aid in maintaining the efficiency of the plating operations at a high level.

Most barrel plating is done in alkaline solutions, which tend to attack grease rapidly. This makes frequent *lubrication* of bearings a necessity; if the equipment is operated eight hours a day, all bearings supplied with grease fittings should be lubricated once a week; more continuous operation requires proportionately more frequent lubrication. A graphite grease such as Dixon's No. 3 is preferred. The cylinder bearings which are submerged in the solution are sufficiently lubricated by the plating solution in well designed barrels. Motors and gear reducers should, of course, be lubricated regularly.

Cathode contacts, which make the electrical connection between the work and the negative side of the circuit, should be *cleaned* regularly once or twice weekly. If they are especially well designed, less frequent cleaning may be necessary. Most cathode contacts are heavily chromium plated to prevent other plated metals from adhering strongly. The cathode contacts should be taken out of the barrel and the built-up metal removed by pounding with a hammer; if they are well designed and have not been used too long without cleaning, the plate will come off readily. It is considered poor practice to strip barrel contacts in acids or with reverse current in alkalies, since the chromium plate will dissolve with the plated metal. In spite of all warnings, cathode contacts are frequently allowed to build up very heavily; they should be so designed that, when neglected, the barrel will not be damaged.

To keep barrel plating equipment spotlessly clean is not practicable. However, certain parts must be kept clean to insure efficient operation. These parts include anode rods, saddles, and horns. It is not possible to make good electrical contacts when contacting surfaces are coated with a crust of dried salts or oxidized from overheating. A protecting roof over the anode rods is simple to construct. Saddles and horns should be washed frequently and cleaned when necessary with emery cloth. When plating barrels in a row are parallel to each other, there is much less dripping of solution onto saddles, horns, and driving mechanism than when the barrels are placed end to end. Barrels for some alkaline solutions can be obtained with the steel anode rods submerged just below the solution level; this eliminates the problem of keeping the rods clean.

While there have been recent improvements in application of synthetic materials to the construction of perforated panels, heads, and rails, they are not yet indestructible. Nails and other sharply pointed parts which may stick in the holes in barrel panels should be removed very frequently or they will become intermediate electrodes, lowering the efficiency of the barrel, and damage the panels. When loading barrels from wire baskets, trays or chutes should be used to avoid abrading the rails with the baskets.

Temperature controls can fail and cause serious damage to barrels from *overheating*, although there is now available a material of construction which will withstand temperatures up to 180° F. Barrels constructed of this material have been operated throughout the entire cycle, including hot cleaners and acids, with no visible warping or shrinking.

Insulation of barrel tanks from the floor and conductors from the tanks is very important. Moist salts if allowed to collect around and over insulators will lead to current leaks and possibly to severe corrosion of conductors.

Barrel solutions usually collect a scum on the surface which should be removed frequently by *skimming*. *Dragin* of acid from pickles, especially muriatic acid, should be avoided to prevent corrosion of anodic steel tanks and other components such as ball anode

containers, which serve an especially useful purpose in barrel equipment by providing a large anode area.

Filters and Pumps.—The difficulty most often experienced with this combination of equipment is the *packing* of the pump. When correctly packed, a pump in operation should leak very slowly, one drop every 20 seconds or so; one can then be certain that the packing is not tight enough to score the shaft. Many pump manufacturers recommend tightening the packing gland with a wrench, backing it off, and making the final setting finger-tight. If the shaft has been scored or the direct-coupled motor is out of line, the pump cannot be properly packed. Recommendations of the manufacturer should be followed for packing and *lubrication*. Nuts and studs which must be unscrewed occasionally should be kept oiled to prevent seizing. Gaskets and surfaces contacted by them should be *clean* before being compressed.

Whatever the nature of the filter diaphragm, it should be protected with a coating of *filter aid* to prevent clogging and to insure the removal of very small particles. Non-permanent diaphragms should be carefully checked for leaks. Do not start discharging the filtrate into a clean, empty tank until it is coming through absolutely clear. Filter bags should be washed after use and not allowed to stand in contact with solution when not in use. Certain types of plug valves require slight lubrication to keep them from freezing while standing idle.

Pump hose, when not in use, should be stored without sharp bends. Means for easy detaching of the hoses for storage is desirable.

Temperature Controls.—The three types of temperature controls in common use are electrically operated, air operated, and direct operating. Electrically operated controls should be kept dry. The air supply for the air operated controllers should be clean and dry. Direct operating controllers require little attention. Be sure the bulb is made of a suitable material which will not dissolve anodically in the plating solution.

Vapor Degreasers.—Because trichlorethylene and perchlorethylene solvents used in vapor degreasers are toxic, maintenance of these machines requires certain precautions. Vapors of these solvents must *not* be inhaled. Degreasers must be cleaned out at regular intervals and fresh solvent added. The cleanout cycle may be determined by the rate with which metal chips accumulate or oil dissolves in the solvent. In the latter case, the boiling temperature serves as a guide, with a cleanout for trichlorethylene indicated by a boiling temperature of about 195° F and for perchlorethylene of about 260° F. Contaminated solvent may be recovered by distillation in specially designed stills available from manufacturers of degreasing equipment. When it is necessary for a man to enter a degreaser for cleanout, a mask which will supply fresh air *must* be worn and another employee *should* stand by outside the machine.

The water temperature at the condenser outlet should be maintained above the dew point of the atmosphere, i. e., at 100 to 120° F, to prevent condensation of water in the vapor chamber.

A serious problem in the operation of automatic conveyor type degreasers is lubrication of chains and sprockets. Because the solvent and its vapors dissolve grease and oil very quickly, little can be done about this problem without changing equipment design.

Ventilating Systems

Because they are frequently located in out-of-the-way places, blowers and their motors are often neglected. Correct *lubrication* of this equipment is important. In addition, the blower fan must be removed and *cleaned* occasionally if it is to maintain its efficiency.

Duct work frequently presents a severe *corrosion* problem depending on the fumes and spray being exhausted through it. Little can be done in the way of maintenance after corrosion has started, and the use of corrosion resistant materials of construction or coatings when making the installation is of considerable importance.

Another important maintenance item is keeping slots in draft boxes open and clear of dried salts. These slots are designed to draw off a given quantity of air, and the system cannot operate properly if they are clogged nearly shut. This is largely a matter of housekeeping.

All duct work should be insulated from plating tanks to prevent *stray currents* and, in some cases, *short circuits*. This insulation in some cases consists of a fabric section of duct adjacent to the draft box. Such sections and other forms of duct insulation should be examined frequently for holes or other types of failure.

Occasionally exhaust systems are designed in such a way that it is possible for spray and fumes removed from one tank to condense on duct walls and drip back into another tank. The dangers of this are obvious, and may require changes in the system.

Miscellaneous

The maintenance of *plating racks* is usually handled in a separate department and will therefore not be discussed in detail. Suffice it to say that simple rack repairs when defects are first noticed may save extensive repairs and even possible destruction of the rack later.

Other items on the maintenance list which are not peculiar to plating establishments are floors, roofs, drains, and steam, water and air lines.

Conclusion

In conclusion, it may be said that the best equipment money can buy will not give maximum service unless a regular program of maintenance is in operation and that such a program will save many times its cost.

A MODERN ELECTROPLATING LABORATORY

MYRON B. DIGGIN
Technical Director,
Hanson-Van Winkle-Munning Company, Matawan, N.J.

THE NEW BUILDING will be utilized to service and improve the H-VW-M line of electroplating and polishing equipment, solutions, and supplies and to develop new products and processes.

Constructed of steel and reinforced concrete with continuous horizontal accents produced by fenestration and toned brick panels, the three-story structure is 105 feet long and has an average depth of 50 feet. It was designed by Singmaster and Breyer of New York City and erected by Spafford Schanck, general contractor of Matawan, N. J. Aside from hallways, lobbies, and corridors, the building contains thirty-three rooms, with all but a few executive offices on the third floor devoted to laboratory purposes.

Referring to the ground floor plan, the stainless steel and curved glass brick entrance leads into a spacious lobby from which access may be gained to main stairway, automatic passenger elevator, rear corridors, and laboratory areas. A door to the right opens on a plating room, 42 x 50 feet, the arrangement of which is the culmination of two years' planning. Complete facilities are provided for experimental and sample cleaning, pickling, plating, and anodizing. An attempt has been made to strike a balance between an aesthetic and a functional arrangement of the equipment, keeping in mind efficiency of operation, use of modern instrumental controls, comfort and safety of technicians, accessibility of services and controls for adjustment and repair and, what is most important in an experimental laboratory in a rapidly changing field, sufficient flexibility to permit easy rearrangements of equipment.

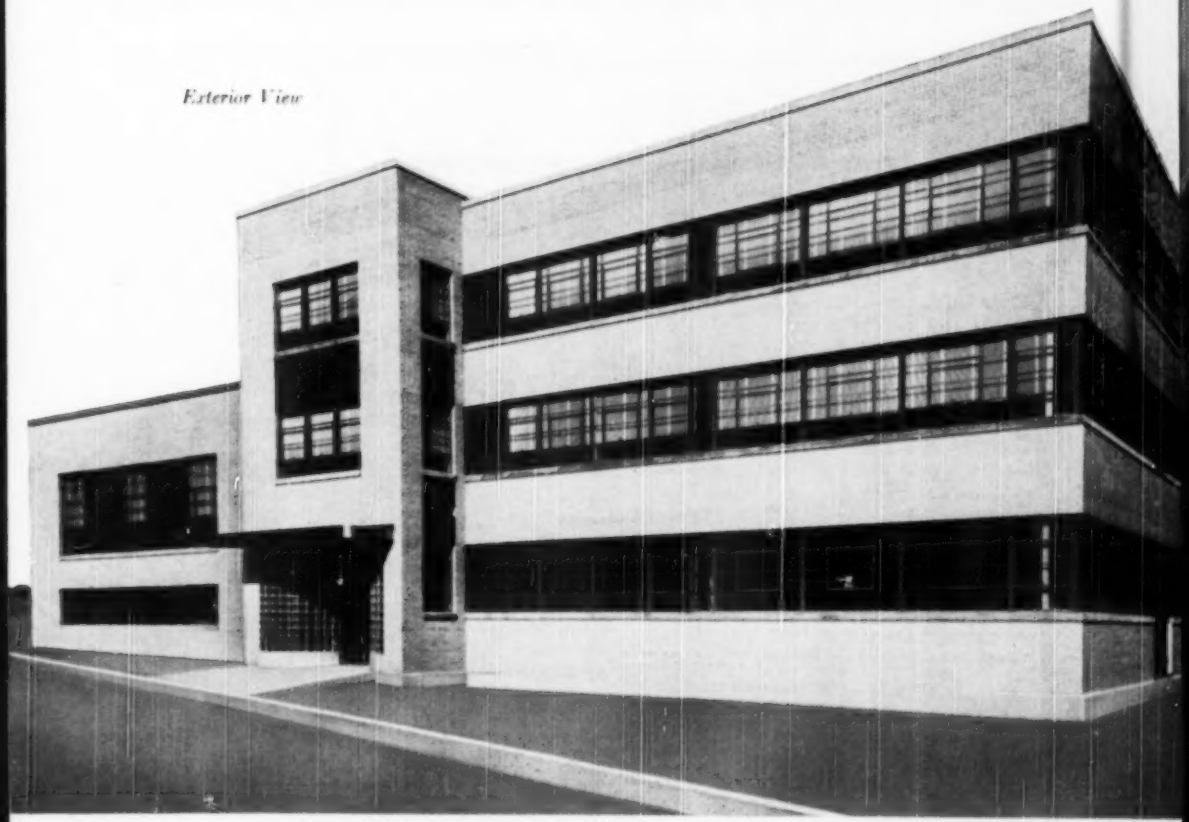
The plating room floor is covered with a $2\frac{1}{4}$-inch thick dark red acid-proof brick pitched in various directions to drainage troughs located a few inches back from the front line of each of the rows of tanks. At the lower end of the troughs a silicon-iron trap and waste line located in an underground tunnel carries the drainage to an outdoor treatment plant. The tanks are mounted on acid-proof brick pedestals. All heated solutions, or those that release fumes, have lateral-slot exhaust hoods. The plenum chambers at the hoods are connected to underground exhaust ducts by 12-inch diameter ceramic pipes. A shut-off damper is provided for each tank. One drawing illustrates schematically the tank locations with respect to drainage ditches, exhaust hoods, service aisles between tanks, and racks for carrying service pipes, conduits, bus bars, rheostats, temperature controllers, and other instruments. The walls in this room are covered with a light buff, glazed tile. The concrete ceilings are treated with a chemically resistant white vinyl-base paint. Uniform lighting with an intensity at working levels of 30 foot-candles is obtained with vapor-proof fluorescent fixtures. Continuous window area on two sides of the room combined with the highly reflective walls and ceilings provides sufficient light during normal daylight hours to make artificial lighting unnecessary.

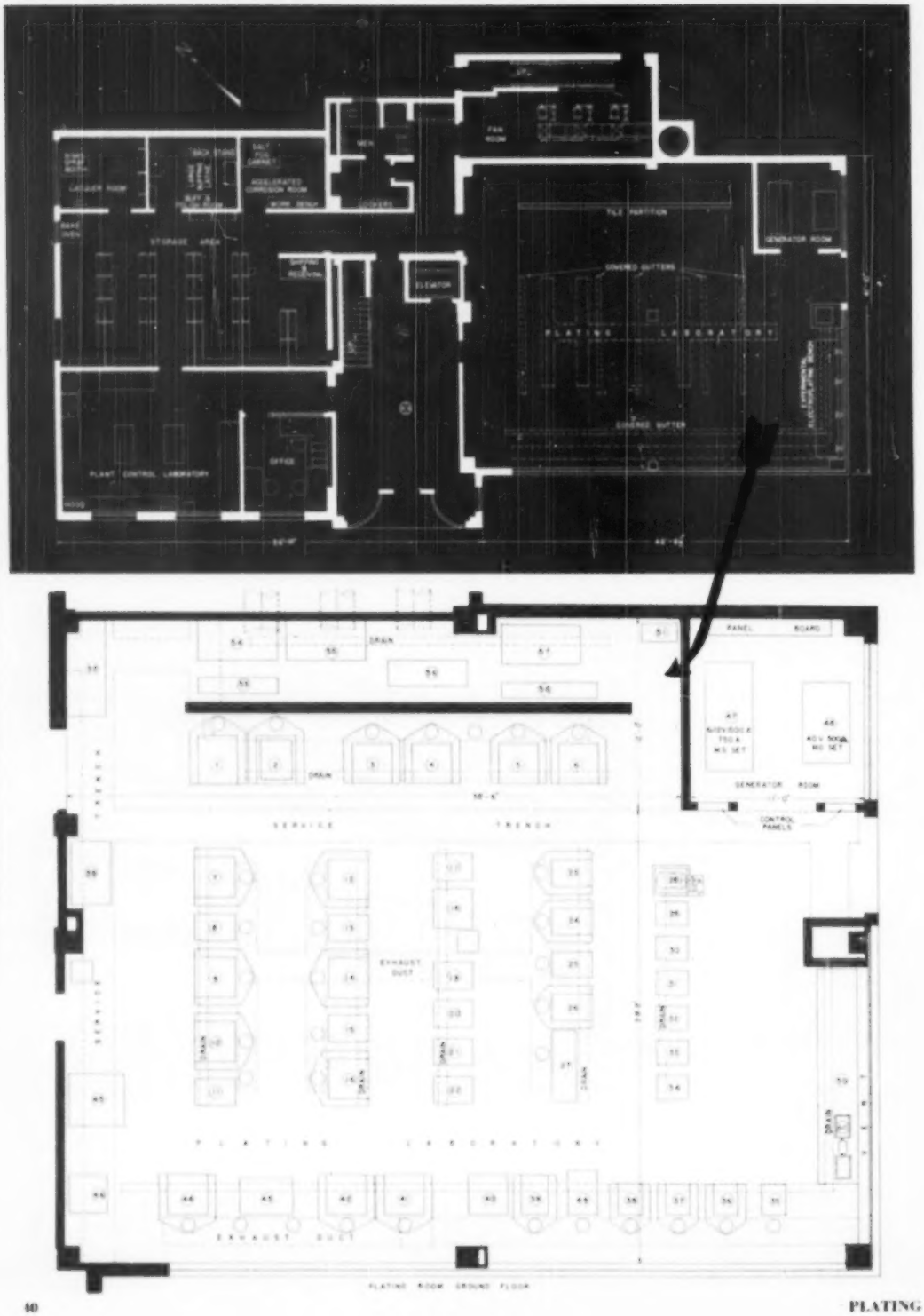
The important electroplating and process tanks are 30 x 36 x 30 inches deep, and the rinse tanks, all of Type 316 stainless steel, 30 x 20 x 30 inches deep. Less frequently used tanks are 20 x 20 x 24 inches deep. The tanks are lined with rubber or synthetics, depending upon the intended use. The numbers on the tank and equipment diagram are keyed to the legend below the drawing.

All services to the tanks, with the exception of electrical lines, are brought into the plating room and to the tanks in underground tunnels. In back of each row of tanks the service piping is brought above floor level and carried on racks. Electrical services, both

The new electroplating laboratory of the Hanson-Van Winkle-Munning Company, in Matawan, N. J., which was completed and put into operation in early November, 1948, is of general interest for two reasons: first, it is probably the largest and most completely equipped laboratory of its kind, testifying to the progress of the plating industry and the Company's faith in its future; second, its design, as a result of careful planning, shows many features of interest to those who plan a similar undertaking. The Hanson-Van Winkle-Munning Company was founded in 1820. It has since contributed greatly to the advance of electroplating, from the time when it was a budding science without art, through a period when secrecy and art predominated, to the present era when art, engineering and science have joined hands. It is very fitting that this old concern with its rich and varied history should erect this modern laboratory devoted to service to the plating industry.

Exterior View




PLATING LABORATORY
GENERATOR ROOM
COVERED GUTTERS
ELEVATOR
STORAGE AREA
PLANT CONTROL LABORATORY
OFFICE
PANEL BOARD
GENERATOR ROOM
CONTROL PANELS
SERVICE TRENCH
EXHAUST DUCT
PLATING ROOM GROUND FLOOR

ac and dc, are also carried on the racks and connected to overhead lines. Services available to the tanks are (1) city water, (2) deionized water, (3) high-pressure compressor air, (4) low-pressure blower air, (5) air exhaust, (6) steam, (7) condensate, (8) silicon-iron drains, (9) 110-volt ac, (10) 220-volt ac, (11) 6-volt dc, (12) 12-volt dc, and (13) 40-volt dc.

A novel arrangement is employed for the auxiliary equipment serving special process tanks No. 1 to No. 6, inclusive. A tiled wall separates the tanks from filters and heat exchangers, with hoses from the equipment brought to the tanks through high horizontal ports and steam, water, air, etc., carried through lower vertical ports. This arrangement provides a service area for the auxiliary equipment which is separate from the tanks, with consequent improvement in appearance and ease of housekeeping.

Along the east wall, an 18-foot long bench covered with acid-proof brick serves as a working space for conducting operations intermediate between the small cell or beaker experiments in the research area on the second floor and the large tank operations in the plating room. On this bench are found experimental dips, pickles, plating solutions, plating barrels, and similar items in temporary use. All the services previously listed, including flexible exhaust ducts, are available in this area.

Current in the plating room is supplied by two dc motor-generator units with capacities of 1500 amperes at 6–12 volts and 500 amperes at 40 volts. The generator room is completely enclosed and is force-ventilated with filtered and tempered air. The generator control panels are built into the walls, making it necessary to enter the room for starting or for field current regulation. A switching device is provided for tapping 6, 12, or 40 volts to various locations in the research laboratory on the second floor. The main power controls and transformers are also mounted in the generator room. Auxiliary d-c current is available throughout the plating room from portable rectifiers. An independent source of d-c current is often advantageous, for example, when plating with auxiliary anodes or when alloy plating with two types of anodes, each with separate voltage control.

At the rate of ventilation provided in the plating room, a complete air change can be made every $1\frac{1}{2}$ minutes, if desired. As mentioned previously, air is withdrawn from the room through exhaust ducts at the tanks. Three underground ceramic ducts of 24-inch diameter terminate in a chamber in the fan room next to the plating area. Three 7000-cfm fans with neoprene covered vanes force the air into a 36-inch diameter ceramic stack in a brick chase extending ten feet above the third-floor roof level. Sliding panels are provided at the intake port of each fan to isolate it from the chamber should its capacity not be needed. Fans are supported on vibration mounts and the intake and exhaust ports connected to the ducts with heavy neoprene sheeting; thus vibration and drumming are effectively localized.

Air to replace what is withdrawn is supplied from the outside through a louvred intake. It passes through multiple viscous filters and then over a coil which is used for heating during cold weather and for cooling during warm weather. A 15,000-cfm fan forces the heated or cooled air into rigid asbestos-cement ducts which distribute it uniformly throughout the plating room and adjacent areas. Under normal operating conditions there will be two exhaust blowers and the intake fan in operation, placing the room under slight pressure. This is an effective method of preventing dust from adjacent indoor and outdoor areas from

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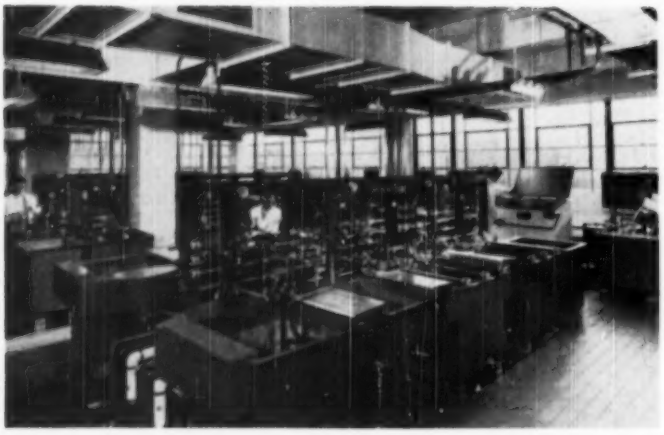
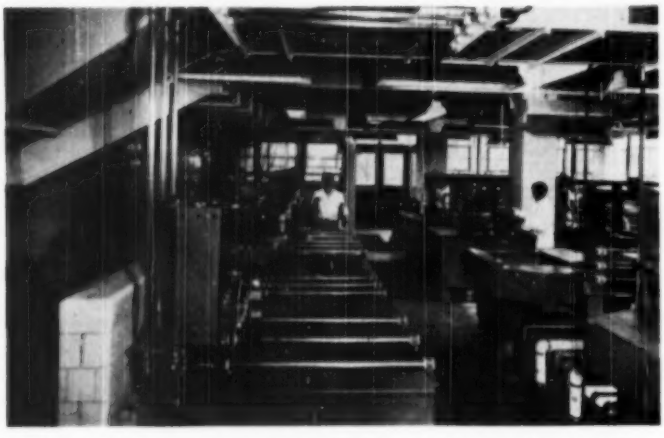
Upper left hand page—Ground-floor plan

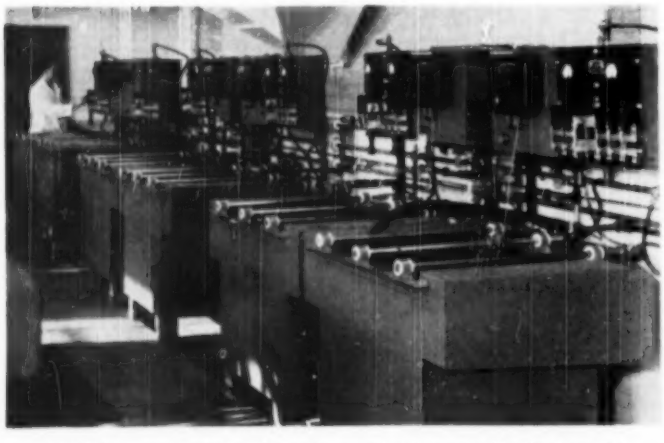
Lower left hand page—Floor plan of plating laboratory on ground floor. The numbers designate equipment as follows:
(1) Bright cobalt-nickel, (2) rapid nickel, (3) albaloy (Cu-Sn-Zn alloy), (4) bright copper, (5) rochelle copper, (6) amine bright copper, (7) soak cleaner, (8) cold water rinse, (9) steel electrocleaner, (10) brass electrocleaner, (11) solvent emulsion dip, (12) brass bright dip, (13) cold water rinse, (14) electrolytic pickle, (15) cold water rinse, (16) hydrochloric acid pickle, (17) cold water rinse, (18) sodium cyanide dip, (19 nickel strike, (20) zincate dip for aluminum, (21) cadmium or zinc bright dip, (22) cold water rinse, (23) hot water rinse, (24) chromic-sulphuric acid pickle, (25) cold water rinse, (26) nitric acid dip for aluminum, (27) centrifugal drier, (28) oblique plating barrel, (29) brass, (30) experimental tank, (31) acid copper, (32) silver strike, (33) silver plate, (34) bright nickel, organic type, (35) cold water rinse, (36) cleaner for manodyzing, (37) acid pickle for manodyzing, (38) manodyzing process, (39) hot water rinse, (40) bright cadmium, (41) bright zinc, (42) alkaline tin, (43) pressure spray rinse, (44) chromium, (45) degreaser, (46) water deionizer, (47) motor-generator set, 6/12 volt, 1500/750 amp, (48) motor-generator set, 40 volt/500 amp, (49) anodize current control, (50) experimental electroplating bench, (51) scratchbrush lathe, (52)racking bench, (53) heat exchanger, (54) filter for cobalt-nickel, (55) filter for rapid nickel, (56) filter for bright copper, (57) filter for amine copper, (58) heat exchanger, (59) desk, (60) plating barrels



Partial view of plating laboratory with tanks Nos. 7–11 in foreground



Partial view of plating laboratory with tanks Nos. 1–6, tiled wall, and auxiliary equipment Nos. 53 and 54 in foreground



Partial view of plating laboratory with close-up of tanks Nos. 6–1

entering the room and contaminating the plating solutions. Another feature is the installation of time delay switches which permit the fans to operate for a predetermined time period after plating operations have ceased. This prevents the hot cleaners and pickles from contaminating the atmosphere during the cooling-off period.

The fan room houses an air compressor, a 220-volt d-c generator serving the carbon-arc illuminator in the metallographic room, and a conductivity cell in the steam return line which actuates a warning gong should a coil or heat exchanger leak and permit electrolytes from the tank to seep into the condensate line. This device not only protects the steam boilers from damage but prevents dilution or contamination of the plating solutions.

In the area to the left of the lobby, a corridor leads to a plating room office and a combined solution-preparation room and materials-control laboratory. This laboratory checks materials that are used in many products, including organic and inorganic chemicals, textiles used in buffs and anode bags, tank linings and rack coatings to determine their suitability with various plating solutions, metals entering into anode manufacture, finished an-

Partial view of plating laboratory with Nos. 39, 40, 41, etc., to the left and No. 27 in right foreground

odes, organic brighteners, and fats, oils and waxes used in buffing compounds. Analytical solutions, sold for control of plating baths, are also prepared in this area.

A main stock room is located adjacent to the materials-control laboratory. Chemicals, equipment, and supplies are stored in steel racks in this room. One section of the room is used for receiving and shipping.

Three rooms are located in the rear of this wing. One is used as a lacquer-spraying and rack-coating room. The spray booth, switches, lighting, ventilation, and floors conform to the rigid safety standards established for areas where flammable vapors are produced. For example, the floor was poured with a special concrete mix containing conductive metallic particles, and copper cables connected to a ground pipe were laid in the forms before pouring; static charges are effectively grounded by this construction. All lighting fixtures, switches, and electrical outlets are of heavy cast-metal construction and are vapor-proof. As an added precaution, windows in this area are scribed with a glass cutter so that if an explosion of vapors should occur, the glass will easily shatter and prevent the explosion wave from damaging the walls. Separated from, but adjacent to, this room a forced-air-circulation oven is provided for baking rack coatings and for the hydrogen relief of metals before and after plating.

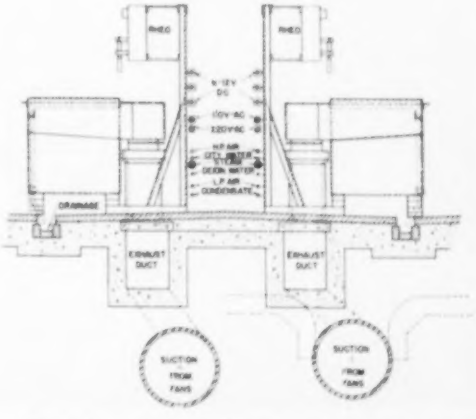
Next to the lacquer room is a polishing-and-buffing room housing a Type MI H-VW-M 5-hp lathe with variable speed drive of 1260-3600 rp,. Buffing compounds, buffs, and polishing wheels are stored in steel cabinets.

Accelerated corrosion tests are made in an adjacent room using a Type CA-2 Industrial Salt Fog Cabinet. In this room is provided a bench for small machine tools, such as a drill press and a belt sander, and miscellaneous hand tools. A small gas-fired furnace for melting experimental batches of metal and alloys is mounted on a fire-brick covered section of the bench.

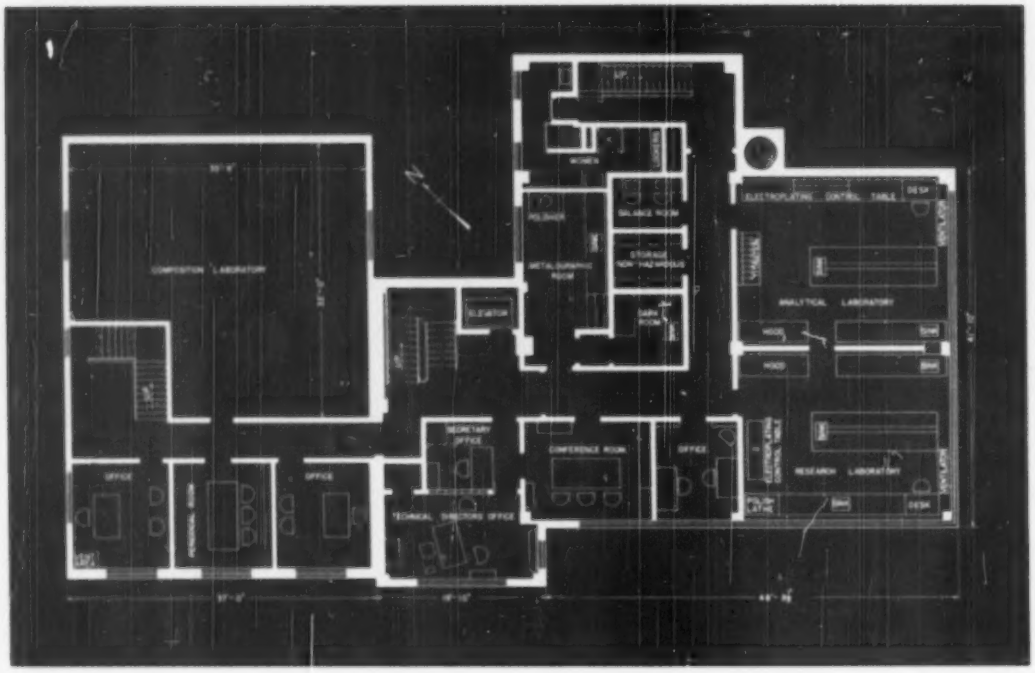
A men's locker and shower room completes the facilities on the first floor.

The second and third floor arrangements are shown in separate drawings. The Technical Director's office is centrally located on the second floor near the main stairway and elevator door. Passing down a corridor, the rooms are, in turn, a library, an office, a research laboratory, and an analytical laboratory. Across the corridor are, in order, a metallographic laboratory with dark room, a stock room, a balance room, and a ladies' room.

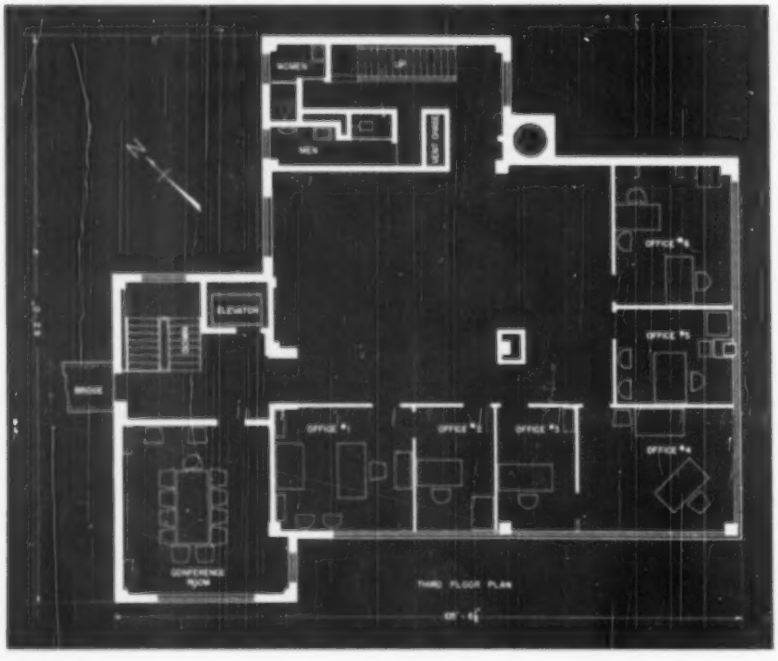
All laboratory furniture is of steel construction with cabinet bases and soapstone tops. It is arranged to give maximum working area without sacrificing aisle space. The research and analytical laboratories have double fume hoods with built-in, flush-mounted, 6-kw



Typical cross-section through tank service lines



Second-floor plan



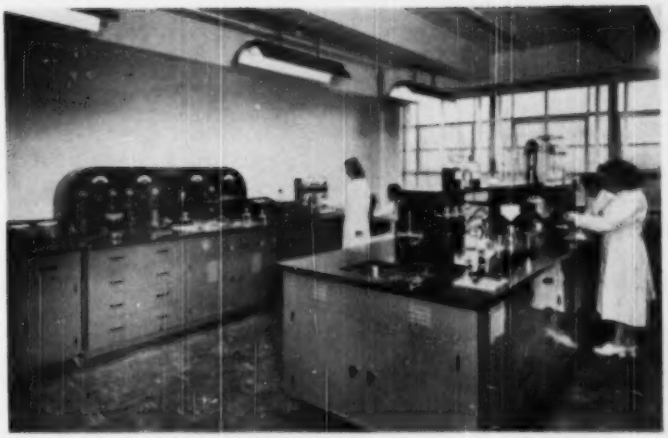
Third-floor plan

hot plates, Diggin Electroplating Control Tables, and provisions for replacing air withdrawn by the hoods with forced, filtered fresh air.

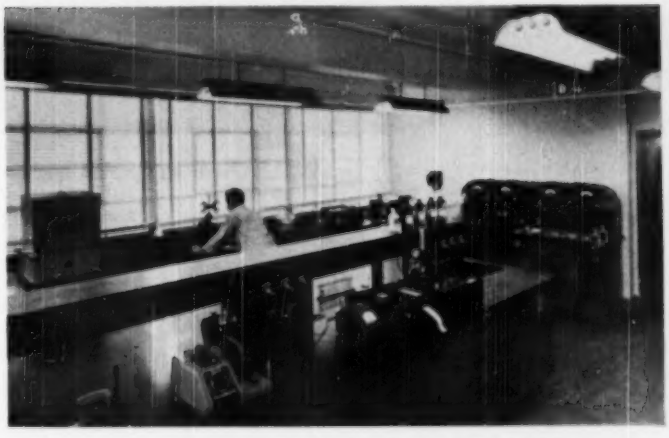
Throughout the second floor, ceilings are of acoustical tile, floors of asphalt tile, and walls of light-reflecting pastel green. Lighting is of fluorescent type and provides 30 foot-candles at working levels. Instant two-way communication between various areas is possible through an intercommunication system having master stations in the technical director's and secretary's offices.

The left wing of the second floor houses a laboratory for investigation, development, and testing of polishing and buffing materials and compounds. A feature of this laboratory is a custom-built precision buffing machine which not only is used for the exact evaluation of buffing and coloring compounds but also is adapted for basic research in this field. Two offices and a periodicals room are located across the corridor from the buffing and polishing laboratory.

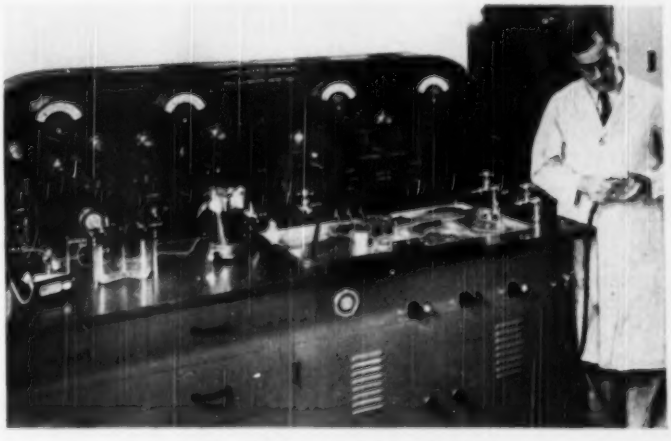
Six offices, a conference room and a large open area suitable for meetings occupy the third floor. Several meetings of technical societies have been scheduled in the new laboratory during the year.



Partial view of the main research laboratory on second floor



Partial view of analytical laboratory on second floor



Diggin Electroplating Control Table

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WILLIAM M. PHILLIPS

WILLIAM M. PHILLIPS, Head of the Electrochemistry Department of General Motors Research Laboratories in Detroit, has a distinguished record of service to the plating industry. Born in Aspen, Colo., in 1887, he graduated with a B.S. degree from the University of Pennsylvania. His industrial experience includes terms as Department Sales Manager with Philip Carey Company, Cincinnati, until 1913, and as Chief Chemist and then Department Manager with Baltimore Tube Company until 1917 when his department became the Inland Metal Products Company, of this he was General Manager until 1921 when he joined the General Motors Corporation.

Among Mr. Phillips' developments which have had large-scale applications in industry are low-pH nickel plating, which also upset much earlier thinking and paved the way for modern bright nickel plating, and bright copper plating from copper sulfate-sulfuric acid baths. Other important studies deal with the effects of polishing prior to plating on the salt spray resistance of the coatings, plating with moving cathodes, and relations between stress and ductility of nickel deposits and their corrosion behavior.

Mr. Phillips has long been a leader in the testing of plated coatings and served for many years as chairman of the joint committee of the American Society for Testing Materials and the American Electroplaters' Society which conducted the early outdoor exposure tests of electrodeposits. He is also known for the exposure work conducted by his company on test sites in Florida and Detroit. Many of his contributions have been the subject of papers before technical groups and articles in the technical press. He has also taken out a number of patents.

Many technical societies have had the benefit of his active support: American Electroplaters' Society (President, 1938-1939; Chairman, Research Committee), Society of Automotive Engineers, Engineering Society of Detroit, Society of the Plastics Industry (Director), Society of Plastics Engineers, Detroit Rubber and Plastics Group (President), American Society for the Advancement of Science, and American Ordnance Society.

During the War Mr. Phillips served as Chairman of the Chromium Plating of Piston Rings and Cylinder Liners Committee and of the Fungi and Bacteria Committee of the U. S. Army. He was also a member of the Rubber Committee on Military Vehicles of the S. A. E. War Engineering Board and the Interim Tire Committee, and served on the Manhattan Project.

Among recognitions that have come to Mr. Phillips are the U. S. Navy Individual Ordnance Award and, twice, the A. E. S. Gold Medal.

His main recreation Mr. Phillips finds in sports, particularly in outdoor sports such as golf and fishing. He is also a teller of stories of no mean repute who knows the art of entertaining his many friends within the industry and without.

DEPOSITION OF PRECIOUS METAL ALLOYS*

A. K. GRAHAM†, S. HEIMAN‡ and H. L. PINKERTON†

II. BINARY SILVER ALLOYS FROM ACID CHLORIDE SOLUTIONS

(Continued from December, 1948)

Introduction

The previous section of this paper described numerous unsuccessful attempts to deposit silver-platinum alloys from alkaline solutions, the ultimate object being to develop a bath for depositing ternary silver-platinum-gold alloys of 60–20–20 per cent composition. These first results were so discouraging that attention was turned to acid electrolytes.

Various acid baths for the deposition of silver, gold, or platinum are reported in the literature (Table III). Of these, the chloride bath is the simplest and seemed a natural starting point for this investigation. Excellent platinum deposits may be obtained from the chloroplatinic acid bath when strongly acidified with hydrochloric acid as recommended by Grube[21]. The bath contains about 20 g/l of platinum as H_2PtCl_6 and 405 ml/l of hydrochloric acid; it is operated hot (160° F) and at a current density of about 10 asf. It is well known that gold is deposited commercially from a chloride bath. Any hope of obtaining silver-platinum or silver-gold-platinum alloys from such a system must, therefore, rest first on the possibility of maintaining sufficient silver in solution in the chloride environment. The desirability of accomplishing this was enhanced by the discovery that good alloy deposits of gold and platinum could be obtained from a combination of the gold chloride and chloroplatinic acid baths. (See Section III of this paper.)

It is, of course, not possible to incorporate a simple silver salt in the chloroplatinic acid bath, for example, due to precipitation of insoluble silver chloride. Precipitation also took place when the sulfamate[22] or fluoborate[23] silver baths were mixed with the chloroplatinic acid bath. The silver iodide[24,25,26,27] bath, however, was compatible with the latter bath and suggested the possibilities inherent in all-iodide or all-bromide system. Study of these systems was deferred, and the first experimental work was confined to the all-chloride system.

Chemistry of Silver Chloride

The solubility of silver chloride at first decreases with decreasing concentration of soluble chloride salts and then commences to increase, a fact which must be taken into account in the precipitation of silver chloride for analysis. Mellor[30] states that the solubility of silver chloride is very nearly proportional to the normality of dissolved chloride salts through considerable ranges. The solubilities of the suitable alkali and alkaline earth chlorides are shown in Table IV. Ammonium and potassium are excluded by reason of their insoluble chloroplatinates. Since the solubilities in the table are expressed in normalities, these figures are also proportional to the amount of dissolved chloride ion and therefore, according to Mellor, to their ability to dissolve silver chloride.

Concentrated hydrochloride acid will dissolve 2.25 g/l of silver as silver chloride at 20° C; in 50 per cent by volume acid the solubility is only 0.42 g/l. Nevertheless, good plates were obtained from solutions of silver chloride in 40 and 75 per cent by volume hydrochloric acids. The efficiency is low, and the bath, of course, has many obvious drawbacks.

Silver chloride-sodium chloride solutions have been proposed[29,79], but the solubility of silver is of about the same order of magnitude as in hydrochloric acid and is a serious limitation.

From the solubility data in Table IV, concentrated solutions of lithium, calcium, and magnesium chlorides should exhibit greater solvent power for silver chloride, and it was found that from 14 to 16 g/l silver as silver chloride could be dissolved in 11-*N* solutions of any of these chlorides at 180° F. The magnesium chloride solution has the disadvantage that it practically solidifies at room temperature; the others remain liquid.

Deposition of Silver

Good silver plates were obtained from all these baths

*The research reported in this paper was sponsored by the Sterling Silversmiths' Guild of America. †Consultants, Graham, Crowley & Associates, Inc., Jenkintown, Pa. ‡Now Chief Chemist, Philadelphia Rustproof Company, Philadelphia, Pa.

TABLE III. ACID SOLUTIONS INVESTIGATED FOR DEPOSITION OF SILVER, PLATINUM AND GOLD ALLOYS

Solution	Investigator	Silver	Platinum	Gold
Chloride	Barratt,[20], Grube[21], Derner[23]	No*	Yes	Yes
Tartrate	Mathers[32]	Yes	?	?
Sulfamate	Piontelli[31]	Yes	?	?
Sulfate	Sanigar[45]	Yes	?	?
Nitrate	Sanigar[45]	Yes	?	?
Iodide	Various [24,25,26,27]	Yes	?	Yes
Bromide	Halberstadt[28]	?	Yes	?
Fluoborate	Sanigar[33]	Yes	?	?
Fluoride	Sanigar[33]	Yes	No	No
Fluosilicate	Mathers[32]	Yes	?	?
Perchlorate	Mathers[41]	Yes	?	?
Glycero-borobenzoate	Marino[37]	Yes	Yes	?

*Silver deposition from chloride baths is mentioned but the conditions are so limiting as to be impractical.

at these elevated temperatures and 2 asf. The lithium chloride bath was chosen for intensive investigation since the lithium chloride at about this concentration (11.8 *N*, or 500 g/l) is only about 2/3 saturated, whereas the other suitable chloride solutions are practically saturated. The amine and ammonium baths are most interesting for silver deposition, as will be discussed later, but must, of course, be excluded here because of the insolubility of their chloroplatinate salts.

The character of the silver deposit obtained from these baths was invariably somewhat spongy unless the bath had been specially treated. It was found that if the bath had been held at 210° F or higher for a short time, the deposits thereafter were an excellent matte white, even when produced at lower temperatures. It is not certain what changes are caused by this heat treatment; possibly the formation of stable complexes is favored or colloidal matter is dispersed in solution. In any event, the character of the plate is greatly and permanently improved. Therefore, in preparing any alloy bath containing silver, the silver halide was first dissolved and the solution was then given a stabilizing high-temperature treatment before addition of the other metal salts.

TABLE IV. SOLUBILITIES OF ALKALI AND ALKALINE EARTH CHLORIDES IN WATER

(Data from International Critical Tables)

Salt	Gram-equivalent weights/1000 grams of water	
	20° C	80° C
Sodium chloride	6.13	6.50
Lithium chloride	18.8	27.1
Magnesium chloride	11.52	13.64
Calcium chloride	13.40	26.4
Strontium chloride	6.66	11.6
Barium chloride	3.44	4.86
Hydrochloric acid	12.4	.....

The simple silver-chloride-lithium chloride bath was studied over the following ranges of composition and operating conditions:

Ag (as AgCl)	0.5 g/l to saturation (about 15 g/l)
LiCl	500–750 g/l
HCl, 28 per cent	0–100 ml/l (20–60 preferred)
Temperature	70° F up to boiling point
Current density	0.2–7.0 asf
Anodes	Silver or carbon
Anode efficiency	About 60 per cent (see text)
Cathode efficiency	100 per cent

The bath is preferably operated at the higher concentrations of silver and best at elevated temperatures (above 160° F) under which conditions the range of satisfactory current densities is wider. With silver anodes, the silver is converted to chloride at 100 per cent efficiency, but about 40 per cent of the silver chloride usually adheres firmly to the anode and does not dissolve. The use of 350 g/l ammonium chloride in place of the lithium chloride causes a rise in the effective anode efficiency to about 90 per cent. When 500 g/l of ethylenediamine hydrochloride is used as the solvent chloride, the silver anode dissolves with 100 per cent efficiency leaving the surface white and clean.

One detail of importance in the manipulation of all these silver and silver alloy halide baths should be noted here. If a wet cathode from a previous water rinse were to be placed in the bath for plating, local dilution of the bath would cause precipitation of silver halide on the cathode surface and consequent poor plate characteristics. Similarly, the bath dragged out on a finished deposit would precipitate silver chloride

on dilution in the following rinse, causing streaking. Consequently, a moderately concentrated alkali halide dip must be used before and after plating.

Deposition of Silver-Platinum Alloys

When platinum as chloroplatinic acid is added to the optimum silver chloride bath, excellent matte or semi-bright alloy deposits may be obtained. The bath used for this alloy had the following composition and was operated as shown:

Ag (as AgCl)	14 g/l
Pt (as H_2PtCl_6)	3–16 g/l
LiCl	500 g/l
HCl, 28 per cent	40 ml/l
Current density	2 asf
Temperature	180° F
Percentage Pt in deposit	11 to 88
Cathode efficiency	50 to 85%, based on Pt^{++}
Anodes (soluble)	Ag, Pt, or Ag–Pt alloy

The platinum content of the plate is almost exactly a linear function of the platinum concentration in the bath and could obviously be controlled over the whole composition range.

Deposition of Silver Alloys with "Platinum Metals"

Alloys of silver with other platinum metals may be deposited from entirely similar solutions. Excellent alloy deposits containing substantial amounts of "platinum metal" have been obtained with palladium, rhodium, iridium, ruthenium, or osmium chlorides in the silver chloride bath. All baths are stable even at very high temperatures, except the silver-osmium bath which must be operated at room temperature. In all cases, the silver bath is stabilized by heat treatment before the alloying metal chloride is added.

As a matter of interest, it is recorded that good alloy deposits from this type of solution were also obtained with copper (cuprous or cupric), mercury, antimony, and bismuth. Attempts to deposit a ternary silver-platinum-copper-alloy resulted in failure, only silver-platinum being obtained. Nickel, iron, tin and arsenic could not be satisfactorily co-deposited with silver. It was found that Ir^{+4} can be plated from a lead chloride bath containing a large excess of alkali chloride, but attempts to co-deposit silver resulted only in silver at low current densities and a spongy black deposit at slightly higher current densities.

III. PLATINUM-GOLD, SILVER-GOLD, AND SILVER-PLATINUM-GOLD ALLOYS FROM ACID CHLORIDE SOLUTIONS

Deposition of Binary Alloys

The successful deposition of silver-platinum alloys from chloride solutions was encouraging with respect to the possibility of depositing the desired 60–20–20 ternary silver-platinum-gold alloy. It should be noted here the expression 60–20–20 includes the following ranges: silver, 60 to 70 per cent; platinum, 15 to 20 per cent; gold, 15 to 20 per cent.

Excellent gold-platinum deposits over a wide range of alloy composition were obtained from a bath containing 16 g/l platinum as chloroplatinic acid, 10 to 16 g/l gold as auric chloride and 300 to 400 ml/l 28 per cent hydrochloric acid, operated at 20 asf and room temperature.

Attempts to deposit a silver-gold alloy from a chloride solution were unsuccessful. Under the proper conditions, the alloy apparently started to deposit but immediately became covered by an immersion deposit of gold. In a simple gold chloride bath, a large amount of disodium phosphate will prevent deposition by immersion on silver. The presence of lithium in the alloy bath, however, precludes the use of sodium phosphate since insoluble lithium phosphate is precipitated. Orthophosphoric acid did not cause any precipitate but also did not prevent cementation; sodium benzoate and glycerophosphoric acid were likewise ineffective.

Deposition of Ternary Alloys

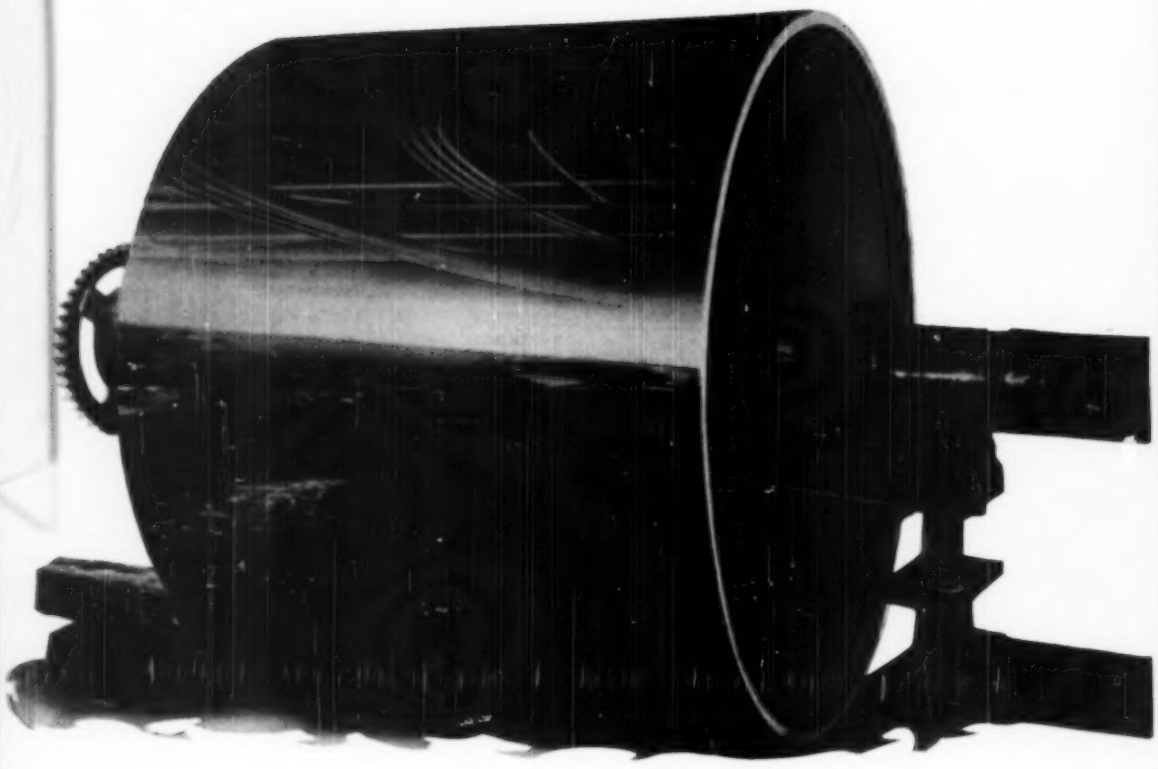
From a lithium chloride bath containing the three metals as chlorides, it was found possible to obtain a deposit of the desired 60–20–20 composition. Numerous other ratios were also obtained with the silver content varying from 40 to 80 per cent. However, none of these were satisfactory in physical character, being mostly dark and somewhat spongy. This was ascribed to the deposition of gold on the deposit by immersion, and all efforts to improve the character of the deposits were fruitless.

A study of the simple gold chloride bath showed that while good coatings could be obtained with the commercial type of bath, the introduction into this bath of as little as 50 g/l lithium chloride caused slight sponginess. This was corrected by raising the temperature to 160° F and adding hydrochloric acid. However, any concentration of lithium chloride in excess of 150 g/l caused sponginess which could only be corrected by raising the temperature to 220° F. Since at least 400 g/l of lithium chloride must be present to hold the silver in solution, this salt appears at least partly responsible for the poor plate quality encountered.

It was concluded that the fundamental chemistry of the ternary alloy bath containing lithium chloride was unsuited to the production of satisfactory deposits of silver-platinum-gold. Considering that the difficulties with the silver-gold alloy bath and the simple gold solution containing lithium chloride apparently could not be remedied by any obvious method, it was decided to explore the halide systems other than chloride.

(*Continued on page 79*)

heavy chromium plating of massive objects is . . .



Fifteen-ton welded steel drum, 6 inches wide x 12 inches diameter. Used for coating paper. Note high luster and uniform reflection from chromium plated surface

BIG BUSINESS

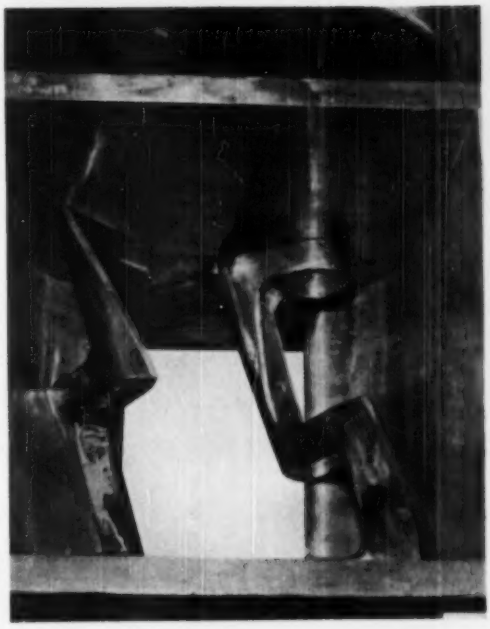
Most people think of applications for hard chromium deposits in terms of relatively small parts: tools, gages, and dies. Such parts represent only a fraction of hard chromium uses. Chromium Corporation of America, in its two plants in Waterbury and Chicago, is equipped to plate and finish parts of almost any size. Another plant, in Cleveland, is devoted to decorative chromium plating. The illustrations on the cover and on these pages show what is being accomplished.

Industrial ("hard") chromium deposits have several unique properties which combine to determine their wide range of applicability. Extraordinarily high hardness, effective resistance to corrosion by a long list of chemicals, low coefficient of friction, low adhesion to contaminating substances, remarkable resistance to wear, and adaptability to a wide range of surface finishes are outstanding.

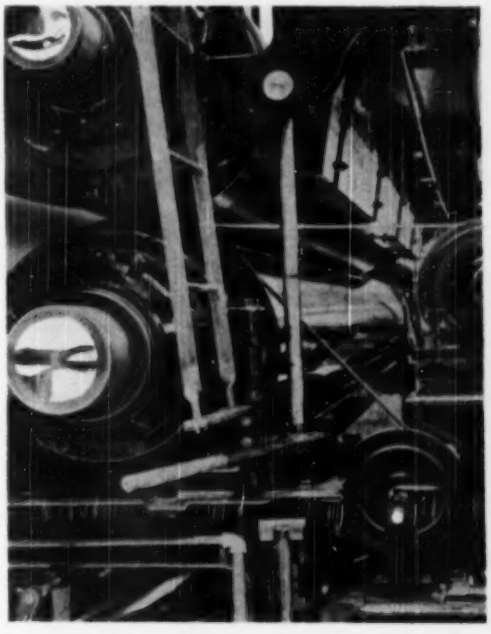
Industry finds many widely divergent applications for chromium plating. Among them are a variety of chemical and food processing equipment; printing and graining rolls and plates; cylinders, rams, plungers, crankshafts and other machinery parts. These are only a few of general interest.

To handle such parts economically and with dispatch, the Chromium Corporation has had to design and build much special equipment, for the preparation of surfaces, for the plating operation itself, and for final finishing, all of which may require a degree of precision ordinarily found in the treatment of small parts only. The craftsmanship and engineering skill required is truly astounding to everyone who recalls that only twenty-five years ago a plater felt himself lucky if he could get chromium to cover simple shapes two days in succession.

(Continued on next page)

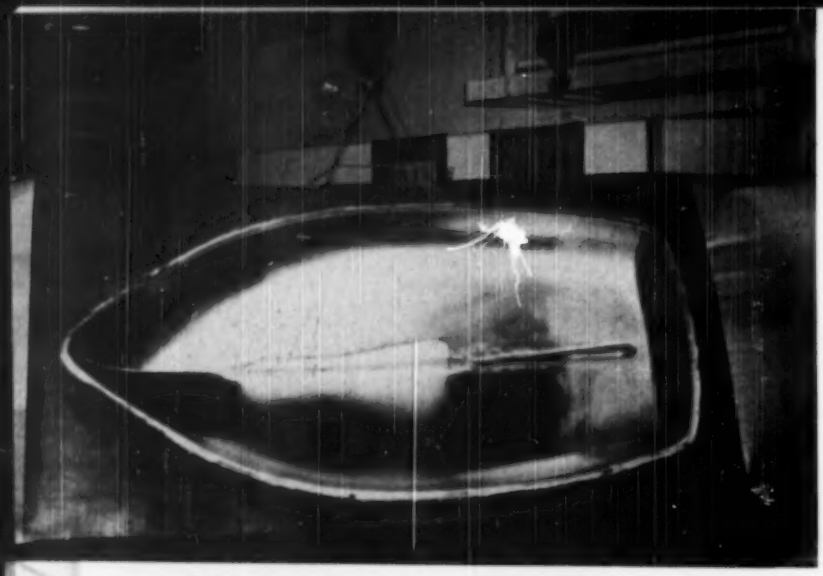


Interior of chewing gum mixer of 1600-pound capacity, driven by 50 hp motor. Chromium plated to 0.004 inch to protect against corrosion and contamination and to facilitate cleaning

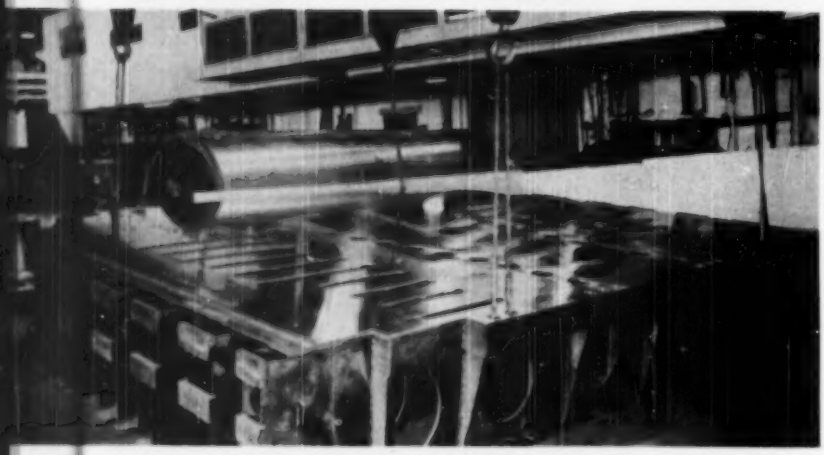


Part of Fourdrinier paper-making machine, showing 19 feet long x 2½ feet diameter 10-ton smoothing press roll. Chromium plated for smoothness, hardness and corrosion resistance

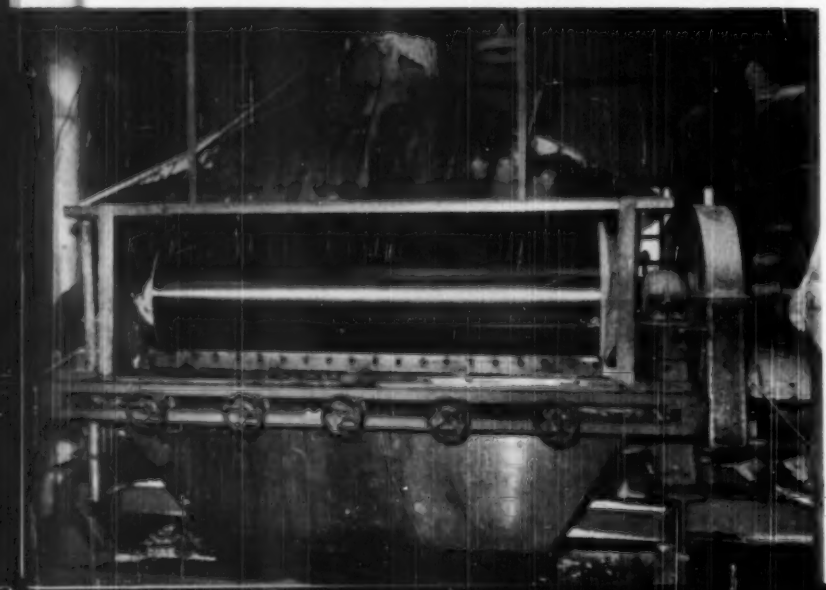
Cover picture: 27-ton cylinder for 10,000-ton forging press. Chromium plated to a thickness of 0.015 inch to reduce wear.



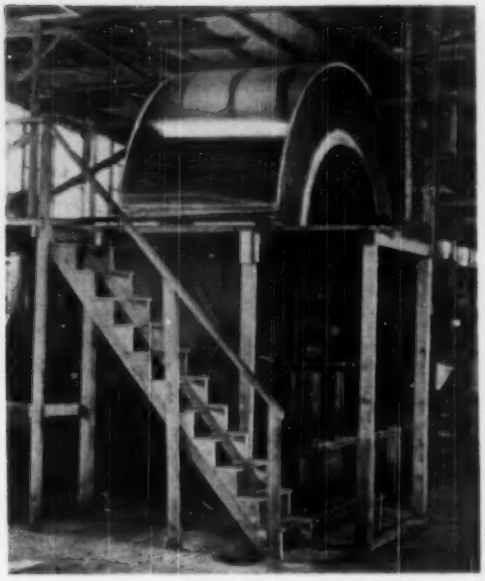
Mold for low-pressure molding of plastic sailboats, about 16 feet long x 5 feet wide x 15 inches deep. Mold cavity chromium plated for corrosion resistance and non-adhesion



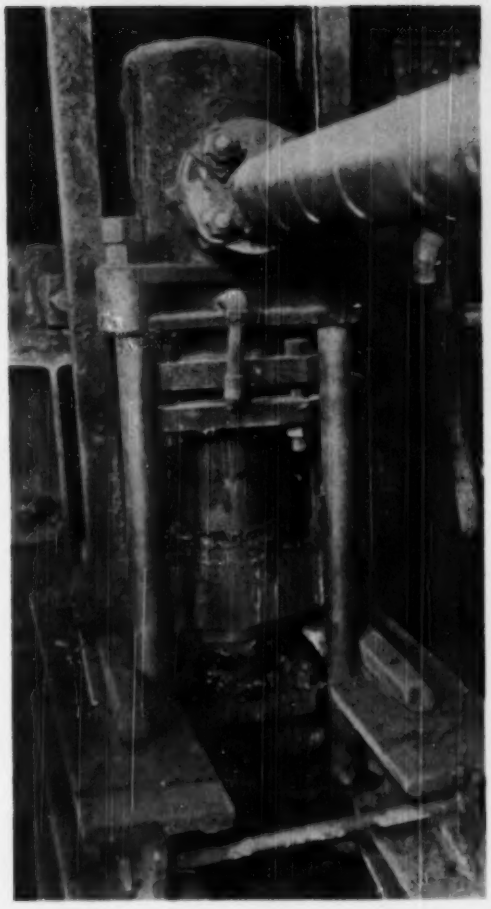
Seven-and-a-half ton wind tunnel section, 13 x 11 1/2 x 2 feet thick. Top face chromium plated and polished for resistance to wear and corrosion



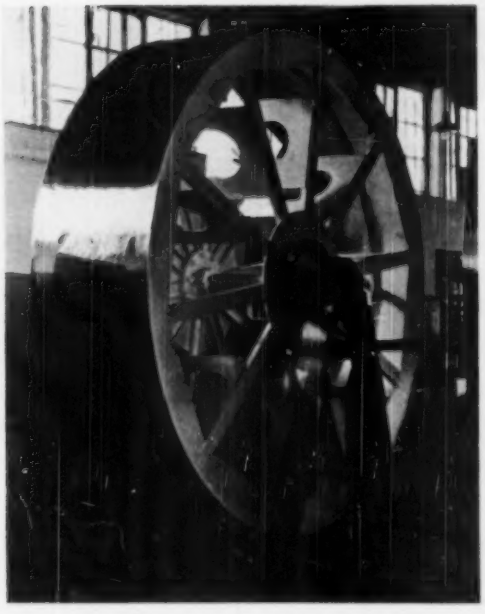
Atmospheric drum drier for dehydration of chemicals. Chromium plated for corrosion resistance and ease of scraping off dried product with resultant low power consumption and high knife life



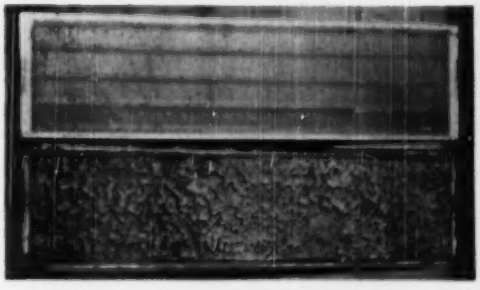
Six-ton welded steel drum, 5 feet long x 6 feet diameter, used in the manufacture of coated paper. Chromium plated and finished to high luster



Eight-inch diameter plunger on hot saw. Chromium plated for retention of smoothness in spite of wear by mill scale from billets



Drier wheel, 22 inch wide x 10 foot diameter, for drying photoprints. Chromium plated and mirror finished for non-adhesion to prints. Photo by permission of Camro Company, Hoboken, N. J. –Chicago, Ill.



Paper mill screen plates for screening wood-pulp after one week's operation. Compare chromium plated open-back plate on top with its low pulp adhesion and freedom from clogging and unplated regular bronze plate on bottom

METHOD

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an incentive plan for job shop plating

PAUL E. MILLER

Miller Electroplating, Inc., Evansville, Ind.

How to increase plating room efficiency and improve employee relations is a problem confronting every plating shop operator. This article describes how a job plating shop employing about twenty men attacked that problem through an inventive plan. While the author disclaims academic perfection, his plan has proved itself during the three years that have passed since its adoption.

• • •

For a great many years the labor for polishing and buffing was by far the largest item in the total cost of plating. It was given serious thought and was held down through piece work plans both for individuals and for groups. Costwise, the actual plating was considered incidental, and a great many shops worked on the theory that one man in the plating room could handle all the work produced by three, four, or more polishers and buffers. In recent years, however, improvements in base materials have minimized polishing and use of bright plating solutions has reduced buffing, and as a result actual plating is now responsible for the major portion of costs in a great many small shops. The large increase in barrel plating, which requires no wheel work at all, is another factor contributing to this trend. Also, the growth of chromium plating, both decorative and industrial, has helped to throw the old ratio of polishing labor to plating labor out of balance.

The war caused a great many shops' dollar-and-cents production to climb far in excess of anything encountered in the past, and greatly reduced or eliminated polishing and buffing. Labor wanted more money, but the employer was partially prevented from paying it unless he could prove to the War Labor Board that the increases were justified. Since selling prices and wage rates were frozen, we came to the conclusion that the best way around the obstacle was to work out an incentive plan.

Requirements

The requirements for approval by the War Labor Board were that the plan would (1) increase production, (2) increase employee's earnings, and (3) reduce the unit cost to the employer.

At first these requirements appeared insurmountable, but now we realize that it forced us to do something under good business conditions that will prove very valuable if and when business becomes poor: it established a much needed yardstick by which to measure plating productivity of labor.

A great many factors had to be considered. The plan had to be simple enough that the employees could readily understand it and, which was more important, could see it reflected daily in increased earnings as the result of a good day's work. It should assure them of their existing pay, and an increase, if earned. It should promote harmony and teamwork between all parties.

In a job shop handling short and long runs of various kinds of work, the problem of keeping tank capacity and labor properly balanced is a difficult one. While one job in a tank can hardly keep one plater busy, another job, due to the different style or size of the pieces being plated, requires two men to keep the same tank operating at capacity. The ratio changes not only daily but several times during a day. Since no foreman can furnish the brains for the whole crew, the idea was to get the men to use their own heads to the advantage of all by taking advantage of any idle time that could be turned to profit.

Unit of Labor Value

We realized that some unit of labor value had to be established, and to this end we fell back on our method of cost accounting. For a number of years we had required all plating room employees to enter on their daily time sheets the amount of time spent on various jobs in actually getting the work prepared and into the plating baths. This time-on-the-job also included that necessary to remove, rinse, bright dip, and dry the work and any other operation peculiar to it, but did not include the time the work was actually being plated in the bath. For example, a given number of parts might require 20 minutes for racking, cleaning, and getting into the plating bath and later on, 6 minutes for removal, rinsing, drying, and returning to the inspector or to the next operator. The total time expended by the operator on the lot would therefore be 26 minutes. According to the new incentive system he would be credited with 26 earned units, a unit being fixed as one minute of time used to perform the above-enumerated tasks.

Anyone familiar with a plating room knows that a great deal of work is necessary other than that of actually getting the work in and out of the tank. Some of these indirect tasks are cleaning of rods and anodes, skimming of solutions, cleaning of rinse tanks, maintenance and purification of solutions, washing down floors, and lending a helping hand in moving heavy articles or containers in and out of the room. In addition, there is starting and stopping time at the beginning and end of the work period, time for lunch and rest periods, time for natural causes, and a great many other peculiar to the individual shop. All of these are necessary to the successful operation of a plating room, but their cost and relation to salable production are likely to be overlooked.

Pause for a moment and look into a job shop plating room. There is no set route that every job must take; the requirements for each are different. Men are moving here and there with various types of work and yet for this apparent confusion there must be a method of actually measuring units of production and their cost. Our plan, with the fixed unit value, has been doing this successfully for some time.

It was found after carefully checking our cost records that, when all the man-hours spent in the plating room were compared with the total number of units produced in the same period, production equalled 37.1 units for each man-hour worked. The check also showed the cost per unit and the fact that we had been making money at this cost.

The Plan

If production could be raised to 40 units per man-hour, instead of the 37.1, our cost per unit would automatically decrease about 10 per cent. With 40 units per man-hour as standard, we could pay a bonus on a percentage basis in exact proportion to the percentage increase in production over the 40-unit standard. All plating room personnel could participate in this plan as a group.

In practice, such a plan would work as follows: If six men in a group each worked 48 hours in one week, the total time worked would be 6 x 48 = 288 hours. For this time each man would receive his regular hourly rate plus overtime earned according to law. The number of standard units for the 288 hours would be 288 x 40 = 11,520. If the group production for the week equalled 13,248 units instead, the bonus would be computed on the 1,728 units above standard (13,248 minus 11,520). This increase of 1,728 units is 15 per cent of the standard production of 11,520 units. Therefore, each man in the group would be paid a bonus of 15 per cent on top of his regular earnings during the period. A daily report was to be furnished the group for the information of its members.

Here, then, was our plan to meet the three requirements of the War Labor Board. Greater unit production per man-hour would, of course, increase our overall production. By establishing a 40-unit hourly standard instead of the previous 37.1 units, we would decrease unit cost. When the group exceeded this standard, it would increase the earnings of its members at no increase to us in unit cost.

The incentive plan gave us two decided advantages: (1) When total unit production for any given period is known, it can be compared to a fixed standard and a quick check made on production efficiency. (2) When total unit production is measured with total cost for the same period, an accurate cost can be found, and, consequently, a sound basis for invoicing the customers is established.

Employee Reaction

It might be of interest to review employee reaction when this plan was first presented. That the utmost care and thought should be given to the proper selling of such a proposal cannot be overemphasized. In our case we held a round table meeting with all parties concerned. The plan was explained carefully and exhaustively in plain everyday language, which made certain that every man present understood each phase as it was expounded. Emphasis was placed on the fact that there could not result a decrease in hourly earnings and that, when business was good and management was pushing for production, the workmen would benefit immediately if they through increased effort could increase the production of hourly units. In shop language, when the gravy train was running for the boss, there was their chance to hop aboard.

Naturally, there came the expected statement to the effect that the men were working as hard as they could and didn't see how they could do any more. To this we practically agreed, but added that if they would take frequent suggestions in a constructive manner, if they would do other jobs between operations, and if they would give a helping hand to the fellow who was being crowded on another job, more units and more pay would result.

It worked successfully, and has been for over three years. During this time, there have not been over 2 or 3 weeks each year that a bonus has not been earned. The bonus rate varies from a some time low of 1 or 2 per cent to as high as 20 to 25 per cent. Of course, our basic hourly rates have been increased with the trend of the times.

Some Specific Advantages

A few items of interest might be mentioned. The 37.1 units per man-hour in the original survey was for acceptable work only, i. e., work which passed inspection. If there were any rejects, they had been replated without being included in the 37.1 figure. However, the men received their regular hourly rate for replating them and paid little attention to rejects. With the incentive plan came the realization that rejects would be re-run without any increase in unit earnings. As a result the greater part of the silly, unnecessary mistakes that cause rejects have been eliminated.

(Continued on page 102)

a. e. s. research project no. 5

project director:

D. T. EWING

associate:

W. D. GORDON

location:

MICHIGAN STATE COLLEGE E. LANSING, MICH.

Acknowledgment is due the Research Committee, Dr. R. M. Wick, Bethlehem Steel Company, Chairman; the Research Directing Sub-Committee, Dr. Louis Weisberg, Consulting Chemist, New York City, and B. C. Case, Hanson - Van Winkle - Munning Company, Chairman and Vice-Chairman, respectively; and the Project Committee, B. C. Case, Chairman; L. B. Sperry, Doehler-Jarvis Corporation, and G. M. Cole, Fisher Body-Ternstedt Division, General Motors Corporation, for their contributions to this project.

The Effect of Impurities and Purification of Electroplating Solutions

I. NICKEL SOLUTIONS

2. Correlated Abstract and Critical Review

Introduction

An extensive search of literature on the electrodeposition of nickel reveals that no thorough and systematic study has been made on the effects of impurities in standard nickel plating solutions. It is well known that impurities, i.e., substances present in small amounts as contaminants, have a marked effect upon the physical properties of the nickel and the operating efficiency of the electrolytic process.

In some cases it is not clear whether the detrimental effect assigned to the presence of an impurity is due directly to the contaminant or to possible combinations of impurities.

The effect of some trace elements is much more pronounced than that of others. As a rule bright nickel baths are much more sensitive to the presence of contaminants than matte nickel solutions.

The reference numbers apply to the Bibliography, Monthly Rev. Am. Electroplaters' Soc. 34, 180–203 (1947).

Ammonium, Sodium, and Potassium

Compounds of ammonium and sodium have been used extensively in formulating nickel solutions. These compounds as well as those of potassium are major constituents and, therefore, the effects noted are not those of impurities. There seems to have been no investigation of the effects of additions of only traces of sodium, potassium, or ammonium ions.

There is no known commercial method for completely removing the ammonium and alkali ions from a nickel plating solution.

Arsenic and Tin

Hazucha[85] found that arsenic not only acts as a brightener but gives a smoother deposit. Diggin[86] confirmed that arsenic in very low concentrations is a brightener and stated that the resulting nickel is brittle and blackens on heating. Wittum[88] and Raub and Wittum[89] reported that arsenic causes the deposits to become dull, streaked, and brittle, and that arsine is generated at the cathode. Moroko, Stepanov and Moroko[90] found that arsenic trioxide addition promoted hydrogen adsorption and codeposition of arsenic and caused the tensile strength of the deposit to decrease; they considered the maximum permissible concentration of arsenic to be 10 mg/l.

Solanki and Singh[91] found that trace amounts of stannous chloride added to a nickel plating solution caused the formation of loose powdery deposits on the cathode.

The Liscomb method of purification has been found[93] to be successful in removing arsenic. No suitable method for the removal of tin from nickel plating solutions has been found.

Sulfur and Selenium

Sulfides have a brightening effect in many types of nickel solutions. Henricks[97] stated that nickel sulfide has a brightening effect but is unsatisfactory due to the evolution of hydrogen sulfide and the precipitation of sulfides. Aryl sulfamides, sulfimides and polysulfonic acids have been listed by Pinner, Soderberg, and Baker[99] as being brightening agents in nickel solutions. At high current densities Haring[179] obtained dark nickel deposits in the presence of sodium sulfite. Bright nickel deposits from some solutions have been found to contain 0.02 to 0.06 per cent sulfur.

Some organic compounds containing sulfur may be removed by carbon treatment, and sulfides may be precipitated at high *p*H, but no general procedure is known for removal of traces of sulfur compounds from commercial nickel solutions.

The effects of selenium are not well

The reference numbers apply to the Bibliography, Monthly Rev. Am. Electroplaters' Soc. 34, 180–203 (1947).

known, but Young[66] stated that traces of it will give a brighter nickel. Puri and Juneja[67] found selenium sols improved the luster and hardness of nickel.

No effective method for the removal of selenium has been proposed.

Silicon and Boron

Boric acid is present in nickel baths primarily for its buffer effect. According to the early literature it was first used principally to prevent pitting and produce a softer and whiter deposit. To accomplish these results relatively large amounts of boric acid or borates are required. These compounds, therefore, are not to be considered as impurities.

While traces of boron may be found in electrolytic nickel, no satisfactory method has been proposed for the complete removal of boron from a nickel bath.

The effect of silicon or boron in trace amounts in nickel plating solutions is not known. If the substance is completely soluble, the effect is probably not appreciable.

Cobalt

More than trace amounts of cobalt are added to some nickel solutions to give brighter and smoother deposits. Therefore this metal is not considered as an impurity.

The removal of traces of cobalt from nickel sulfate plating solutions is difficult. Although cobalt readily codeposits with nickel no effective short procedure for its complete removal has been proposed. Fink and Rohrman[221] removed cobalt from small volumes of solution by electrolysis using rapid circulation of the cathodyte, high *p*H, and a current density of 1.0 to 1.5 amp/dm^2 (9–14 asf).

Tungsten

Alloys of tungsten and nickel are formed from nickel baths containing tungsten in solution. The deposition of tungsten-nickel alloys has been studied by Gol'tz and Kharlamov[151], Belyaev and Lipovetskaya[17], Sklyarenko, Druzhinina, and Masal'tseva[185], Holt and Nielsen [88, 89], and others.

No method has been proposed for the removal of trace amounts of tungsten from nickel plating solutions.

Molybdenum

While ammonium molybdate in nickel solutions will give a dark deposit, it is not known what its effect would be when present in small amounts as an impurity.

No methods for the complete removal of molybdenum from nickel plating solutions have been proposed.

Mercury

Solanki and Singh[63] added trace amounts of mercuric chloride to nickel plating solutions and obtained loose powdery deposits of nickel. Some tolerance to mercury is indicated by the finding of W. M. Tucker* that all Canadian nickel contains 1–2 ppm of this metal.

No method for the complete removal of mercury from commercial nickel plating

Phosphorus

The effects of small concentrations of phosphorus in nickel plating solution and effective methods of its removal are not known. A darkening of nickel deposits from solutions contaminated with phosphorus along with other impurities such as aluminum have been noted.

Chromium

Macnaughtan and Hammond[126] studied the effects of chromic acid and chromium sulfate in nickel plating solutions. The presence of 0.0248–0.20 g/l chromic acid caused a decrease in cathode efficiency and at 0.220 g/l deposition ceased while the evolution of hydrogen increased; 0.01–0.025 g/l caused an increase in the stress of the deposits with some exfoliation. The addition of chromium III sulfate to give a chromium concentration of 0.149 g/l caused a drop in cathode efficiency to 81 per cent and an increase in brightness of the deposits with a tendency to peel; the anode efficiency was not affected.

Hothersall and Hammond[81] found that the presence of chromic acid increased the evolution of cathodic hydrogen and did not stop pitting. With a given concentration of chromic acid, the lower the *p*H of the solution, the less hydrogen was evolved and the higher the stress in the deposit.

Pietrafesa[176] stated that the cause of the effect of chromium in nickel plating solutions is a decrease in hydrogen overvoltage and the formation of chromium chromate and chromium hydroxide in the colloidal state. Puri and Seth[63] investigated the action of chromium sols and found them to have a tendency to increase the luster of nickel plate; the oxide sols rendered the deposit hard and uniform. Martin[62] found in low *p*H Watts bath that hexavalent chromium had little effect on stress in nickel except at a *p*H of 5.5 where a marked increase in stress occurred.

In general one may conclude that chromium contamination in nickel plating solutions leads to reduced cathode efficiency and deposits in a marked degree of stress.

Several methods for the removal of chromium from nickel solutions are noteworthy. Macnaughtan and Hammond[126] recommended two procedures: In one, ferrous sulfate was added in an amount sufficient to reduce all hexavalent chromium to the trivalent state after which nickel carbonate powder was added to increase the *p*H of the solution and precipitate chromium III hydroxide. At high temperature the rate of formation of chromium hydroxide was increased. Finally the solution was filtered and adjusted to the proper *p*H. In another procedure, powdered nickel carbonate was added and the temperature maintained at 37° (95° F) for 18 hours while the solution was being agitated with air.

Weisberg[241] reported that chromium contamination can be removed by the Liscomb method, by electrolysis at a *p*H of 2 and very high current density, and as lead chromate by electrolysis with lead anodes. Wiesner[243] showed that trivalent chromium may be removed at a *p*H of 5.0–5.2 by heating at 100° C (212° F) for 3 hours. Diggin[66] removed chromium by the addition of lead carbonate to form lead chromate.

Zinc

Thompson and Thomas[198] found that 0 to 0.1 per cent zinc in nickel sulfate was not detrimental, that 0.2 per cent tended to brighten the deposit in the high current density region and produce some pitting, and that 0.3 per cent tended to brighten the whole deposit. Setlik[187] found that 0.113 per cent zinc in a nickel plating solution retarded the rate of deposition, while 0.226 per cent caused stains to form on the deposit. Anderson[93] also reported that more than 0.3 g/l of zinc in a warm nickel solution would brighten the deposit, that cracking and poor corrosion resistance developed, reaching serious proportions at about 0.6 g/l, and that specimens plated from a solution containing 1 g/l in a sulfate-free solution contained 0.2 per cent zinc. Vozdvizhenskii and Makolkin[231] investigated the causes of streaky deposits and found that satisfactory nickel deposits could be obtained in concentrations of 0.45 parts of zinc per 100 parts of nickel in the bath, but when the zinc content was between 0.45 and 0.65, the deposits were streaky; streaks did not form at higher bath temperature; above 0.65, the streaky deposits were persistent. Meyer[142] stated, "As little as 0.0067 oz/gal (0.05 g/l) of zinc will cause the nickel deposits at low current densities to be bright and somewhat more brittle. Higher concentrations of zinc will cause the nickel deposits to be very brittle and, for example, a concentration of 0.03 oz/gal (0.225 g/l) of zinc will cause the nickel deposits to be very brittle, particularly in the low current density range". According to Diggin[66] zinc in bright nickel solution makes for dark plate in the low current density regions.

*Private communication.

Vuilleumier[124] reported that the presence of zinc caused an increase in the contraction of nickel deposits. Martin[67] however, found that in low-*p*H Watts-type solutions zinc does not materially affect stress, while at a *p*H of 5.5, zinc reduces stress; this latter observation is in contradiction to Vuilleumier's observation which was also made on a high *p*H solution. Haring[179,180] reported that the presence of zinc increased the throwing power of a nickel plating solution.

Zinc in amounts of 0.007 oz/gal (0.05 g/l) is used as a brightener in dull-nickel plating solutions; higher concentrations will yield brittle deposits, which may be either dark or streaked. Zinc is also used as a promoter metal in certain organic-type bright nickel baths.

Two general procedures for removing zinc contamination from a nickel plating solution have been proposed. The Liscomb method[110] is effective and, according to Anderson[261], is capable of reducing the zinc concentration from 1 to 0.025 g/l. Wiesner[64] found that zinc was not appreciably removed from nickel sulfate solutions until a *p*H of 6.4 had been reached. A typical procedure for precipitating zinc, outlined by Stocker[67], consists of heating the bath to 140° F, agitating the bath, and then raising the *p*H to 5.6 by adding freshly precipitated nickel carbonate as a slurry, slowly with much stirring, to the solution; a slurry of lime is then added slowly with vigorous stirring until the *p*H approaches 6.0 to 6.2. This treatment is not only effective in removing zinc but also aluminum, iron, trivalent chromium, selenium, and cadmium. Costello[27], Jevell[212], Smith[128], Weisberg[98], and Wesley and Roehl[84] have also recommended this procedure, or one essentially the same.

Anderson[261], Mattacotti[181], Weisberg[98, 99], and Diggin[264] have recommended low current density electrolysis as an effective method for removing zinc.

Aluminum

O'Sullivan[181] found that aluminum hydroxide may accumulate on the nickel cathode surface in a colloidal form and cause darkening of the deposit as well as affect the structure of the nickel. Aluminum hydroxide added as a sol to a nickel plating solution gave an improved luster according to Puri and Juneja[213] who also noted an increase in hardness and brittleness. Martin[67] found that aluminum causes increased stress at *p*H 5.5.

Although aluminum in trace amounts may function as a brightener, dark deposits with increased brittleness and stress have been found. Aluminum in the presence of phosphates darkens the deposit*. The effect of aluminum as an impurity has not been thoroughly investigated.

effectively removed from nickel sulfate plating solutions free from organic substances by precipitation at *p*H 4.3 and 100° C (212° F), and filtration. Nickel hydroxide and carbonate[224] or magnesium and calcium carbonates[148] with agitation and aeration may be used to precipitate aluminum hydroxide.

Cadmium

In 1915 Proctor[68] stated that cadmium introduced anodically in a nickel plating solution gave a bright deposit of nickel. Later Mills[130] and Carlson[111] recommended the addition of cadmium as a chloride to give bright smooth deposits*. Numerous articles have appeared since on the use of cadmium as a brightener such as by Proctor and Sizelove[207], Underwood[202,203], Raub and Bihlmaier[108], Vozdvizhenskii and Sulefmanova[144], Young[85], and Pollack[88]. White and Proctor[227] found that the brightening effect of cadmium, as cadmium chloride, increased with its concentration up to 0.05 per cent in a standard still bath; with from 0.05 to 0.1 per cent cadmium, no apparent change in the nature of the deposit was noted, but with more than 0.1 per cent the quality was definitely lowered as the concentration of cadmium was increased. Hard deposits with cracks are formed from solutions containing cadmium in excess of 0.5 g/l (0.067 oz/gal), according to Evlannikov and Neiman[105]. Wittum[144] found the upper limit of cadmium to be 1.6 per cent.

Meyer[107] considered 0.013–0.067 oz/gal (0.1–0.5 g/l) a favorable range; with 0.13 oz/gal (1 g/l) poorly adherent and black deposits were formed at current densities of 6 asf (0.65 amp/dm²) or less, bright and spotted deposits at 6–22 asf (0.65–2.4 amp/dm²), and clouded and streaked deposits at still higher current densities; concentration above 0.67 oz/gal (5 g/l) gave deposits which were brittle and nonadherent. Raub and Wittum[211, 178] judged cadmium to be an unsuitable brightener because it codeposits with nickel periodically and stated that since cadmium deposits with less polarization than nickel, the concentration of cadmium will be higher in the deposit than in the solution.

Haring[181] and Sizelove[182] reported that cadmium decreases the throwing power of nickel plating solutions. Haring found that nickel deposits from solutions 0.001 *N* in cadmium were alternately bright and gray, except at high current densities where brighter deposits than normal were obtained. Hoefer[198] claimed that the presence of cadmium reduces the bath voltage. Eckelmann[247] stated that cadmium tends to promote the codeposition

While excessive concentration of cadmium increases the brittleness of electrolytic nickel no comprehensive investigation is found in the literature which deals with the effects of cadmium in nickel plating solutions free from metallic impurities.

Copper

At low current densities copper is deposited more readily from most nickel plating solutions than is nickel. Thompson and Thomas[150,216], working with a nickel sulfate-chloride solution at *p*H 5.5–5.85, observed roughness at the cathode edges when small amounts of copper were present; the nickel deposits were satisfactory with 0.007 g/l copper, but as the amount of copper increased beyond 0.035 g/l, roughness and darkening of the deposits were noted. Haring[179] noted that copper produced dark spongy deposits at low current densities and that this effect gradually diminished with increasing current density. Setlik[207] stated that 0.243 per cent copper in a double nickel sulfate solution buffered with boric acid caused a discolored deposit; with 1.27 per cent copper, nickel ceased to be deposited, and with 2.53 per cent copper, only powdered copper was deposited.

In gray-type nickel solutions, according to Diggin[264], copper may be tolerated up to 0.38 g/l, while in bright nickel plating solutions the maximum copper content is approximately 0.0075 g/l. Eckelmann[247], Johnson[168], and Francis-Carter[215] have pointed out that the two most pronounced effects of small amounts of copper in bright nickel solutions are the dull dark deposits in the low cathode current density regions and a general fogging of the deposit in other regions.

The removal of copper from nickel plating solutions may be effected by low current density electrolysis. Fink and Rohrman[271] in an extensive investigation have shown that 10 mg/l copper in a 1-*N* nickel sulfate solution can be removed by electrolysis at a current density of 3.15 asf (0.34 amp/dm²) on a cathode which is rotating 3000 rpm; at a *p*H 5 and 20° C (68° F) the cathode efficiency was 98 per cent; higher acidity favored the formation of hydrogen while at higher *p*H nickel deposited in increasing amounts.

Chemical separation of traces of copper is seldom used, although copper oxide, sulfide, etc., are quite insoluble. At *p*H 5.8 and 100° C (212° F) the solubility of

*Unpublished information by D. T. E.

*Brightening effect of cadmium salts was discovered in the Elkinton plant in Birmingham, England in 1912[69].—Editor.

copper it; a boric acid-nickel sulfate solution is about 20 mg/l; appreciable quantities of nickel hydroxide form at this *p*H*.

Copper may be removed by electrolytic deposition on the surface of metals. Nickel may be used, but the required surface is large and the rate of removal is so low that the process becomes very time consuming.

Bogitch[351] proposed a process for the removal of traces of copper and other metallic ions by passing the nickel solution over nickel hydroxide.

The most effective method known today for the removal of small amounts of copper seems to be low current density electrolysis at low *p*H, high temperature and high rate of agitation.

Calcium

Due to the low solubility of calcium sulfate in most nickel plating solutions the concentration of the calcium ion is low. The effects of the calcium sulfate suspended in the solution are roughness, pitting and dullness, according to the work by Meyer[329], Hogaboom[211], Diggin[188], and Kushner[329].

Calcium sulfate crystals are readily removed by filtration, but no methods for removing calcium in very low concentration have been reported.

Lead

Although the solubility of lead sulfate is low, the concentration of lead may be quite appreciable in nickel solutions containing chlorides and organic compounds such as acetates. Sheppard[345, 198] recommended lead acetate and glycerine as brightening agents. Raub and Wittum[458], and Wittum[459, 460] found that lead caused deposition of fine-grained, lustrous deposits which were bright and brittle with a tendency to peel and to be rough; lead sulfate caused dull and spotty nickel deposits. Cosgrove[108] reported that lead contamination caused nonadhesion of the deposit which became very noticeable on chromium plating. Ballay[24], Mattacotti[267], Meyer[329, 332], and Stocker[410] found that lead gave rise to dark, streaked deposits; the effects were most noticeable in low current density regions. Martin[267] observed that lead in low concentrations had little effect on the stress in nickel deposits from a low-*p*H Watts type bath, but reduced stress at *p*H 5.5. In bright nickel solutions, according to Eckelmann[137], Johnson[218], and Francis-Carter[168], lead contamination causes dark streaks to appear. In nickel-cobalt bright nickel solutions, Weisberg[436] found that under average conditions 5 mg/l lead gave a dark deposit in the low current density region of a bent cathode.

Lead can be removed from nickel solutions, Stocker[410], Mattacotti[267], Weisberg[436], and Diggin[184] have stated, by electrolysis at 2–3 asf (0.2–0.3 amp/dm²) at *p*H 2 and a fairly high temperature.

Magnesium

The effects of small amounts of magnesium in nickel plating solutions have not been reported. However, the effects of large amounts have been noted by many workers and claims have been made for deposits with higher lustre, hardness, uniformity of texture, and whiteness. Diggin[186, 184] reported that magnesium sulfate gives softer, ductile deposits, and Hammond[178], Underwood[421], and Diggin[184] found that it increased the bath conductivity. Magnesium sulfate additions have been used commercially in plating on nonferrous materials and in barrel plating solutions.

No efficient method for the removal of small amounts of magnesium is known.

Manganese

Barrows[24] and Meyer[324] have stated that rough deposits may result from the presence of manganese as a contaminant. Thomas and Blum[414] found that manganese does not reduce the porosity of nickel.

Iron

The effect of iron as an impurity[172] is twofold: as ferric hydroxide in the colloidal or precipitated state it causes roughness of deposits, and in the soluble form it codeposits with nickel giving harder deposits with a certain amount of stress. One form of pitting is caused by this impurity.

Iron may be removed by low current density electrolysis† or by precipitation as ferric hydroxide followed by filtration.

Nitrates

Mathers and Sturdevant[267] found that nitrates in a nickel solution depressed the current efficiency very strongly. Watts[430] stated that nitrates in higher concentrations may cause the deposition of nickel to cease entirely. Eldridge[132] recommended the use of small amounts of nitrates as an oxidizing agent. Hothersall and Hammond[201, 332] found that nitrates caused increased hardness and stress in the nickel and had a brightening effect, that the deposit had tendency to crack and become exfoliated, and that pitting may result from their presence.

At high current densities nitrates do not seem to decrease porosity and may decrease throwing power and cathode efficiency, according to Diggin[186, 66].

Nitrates may be removed, according to Hothersall and Hammond[201], from the solution by electrolytic reduction at the cathode.

Organic Substances

Citrates, tartrates, formates, lactates, acetates, many organic acids, etc., have a decided effect on the properties of electrolytic nickel. Since these substances are intentionally added to a nickel solution as part of the formula and are usually present in large amounts, they are not considered impurities.

Another class of substances, exemplified by the reduced form of certain dyes as well as the aryl sulfonamides, sulfimides, polysulfonates, etc., have marked effect; they are added under carefully controlled conditions to give bright nickel and are not impurities.

Organic matter of many types may be present in small amounts and function as detrimental impurities. Greases, waxes, dust, etc., present in solution or the suspended state may cause pitting, brittleness, and a dulling of bright nickel.

Methods of removal usually involve oxidation for their destruction or filtration with activated carbon or both. Chlorine, hydrogen peroxide, potassium permanganate have all been used as oxidants. For filtration with carbon Helbig[178, 202], Mattacotti[267, 402], Smith[398], Stocker[417, 418], Jeveli[210], Meyer[329], Smith[398], Weisberg[441, 188], Shcherbakov, Loshkarev and Loshkarev[371], Case[103], and Diggin[184] have presented very efficient methods.

Conclusion

It is concluded from a study of the electroplating literature that an extensive amount of investigational work must be carried out before the effects of impurities in electroplating solutions can be evaluated. Only a limited amount has been done on the *specific* effect caused by the presence of a single impurity added to a plating solution, otherwise free from trace impurities. This laboratory is now undertaking the task of determining the effects of metallic and certain organic impurities on some of the physical properties of electrodeposited metals.

a. e. s. research

Copies of January and March Issues Desired

The Executive Office has only a few copies left of the January and March, 1948 issues of Plating.

If those who do not plan to keep their copies would send them to P. O. Box 168, Jenkintown, Pa., their assistance will be very much appreciated.

*Unpublished data. †Unpublished results (D. T. E.).

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——readers' questions of general interest——

Q. 39. I often have tea-sets to replate, and in quite a few instances the handles are what I term black metal, not white metal; in too many cases these handles have lifts on them after plating that means cutting down again and replating the handles where they do not show proper adhesion. Any suggestions that you can make for the proper plating of this metal will be greatly appreciated.

A. What I think is giving you trouble is a heavy tin oxide which has formed on the pewter or Britannia metal while it was stored under unsatisfactory conditions.

We start off by giving it a good cleaning and then strip the old silver in a solution composed of about 12 oz/gal of cyanide, using reverse current at 6 volts. After the silver has been removed, we give it a good scratch brushing. If at this point the article shows any of the oxide referred to, we immerse it in 10 per cent muriatic acid solution for about 15 minutes, give it a good washing in running water, and scratch brush again, repeating this treatment until all the oxide is gone.

Upon its return from the repair and buff departments to the plating room, we first give the article a good cleaning, and then another good scratch brushing especially in the corners where buffing compound and flux may have lodged. This is followed by scouring with 3F pumice stone powder and thorough washing before immersion in the silver strike, which contains 5 dwt/gal of silver, for a few minutes at 6 volts. We then go into our regular silver solution for about 15 minutes, take it out and give it a good stiff scratch brushing. If this does not break down the first deposit, we give it a good wash and return it to the silver solution where it may remain as long as desired.—John H. Feeley.

Q. 40. The present fuel situation in our territory has brought us numerous requests for information on heating plating tanks electrically. Our electroplating customers want to know the capacity of electric heaters required to heat a tank to its operating temperature and how much it will cost to operate at that temperature.

We feel we are able to answer the first question in a satisfactory manner by the use of published data and heating curves for heating plating solutions, but we do not know how to calculate the heat produced by the passage of the current through the solution, which we need to determine operating costs. Can you help us?

A. The heat generated on passage of current depends on the resistance in the solution, i.e., its specific resistance and the size of the current path, and hence varies with the solution, tank size, method of racking, etc. Table A, as an example, shows the kilowatt input during plating in a 4000 gallon bath at 1, 1.5 and 2 amp/gal and tank voltages of 3, 6, 9 and 12 volts. By disregarding the voltage losses by anode and cathode polarization which are usually small, these figures can be used to estimate the quantity of heat available in excess of that from any heat source such as electric immersion heaters.

TABLE A. KILOWATT INPUT DURING PLATING

Current Concentration amp/gal	Total Current amp	Bath Voltage, volt			
		3	6	9	12
1.0	4000	12	24	36	48
1.5	6000	18	36	54	72
2.0	8000	24	48	72	96

It should be noted that as the current concentration in amperes per gallon increases, the bath voltage also increases for any given spacing of anodes and cathodes. Also, some articles can be plated with relatively low spacing, such as 3 or 4 inches, while others require as much as 12 inches; naturally, the voltage required for a given current input, and hence also the kilowatt input, increases with increasing spacing.

As a rule the most important requirement when installing heating facilities is to furnish sufficient capacity to heat the bath to operating temperature in a reasonable time. After the operating temperature has been reached, heat may be required to maintain it, but in many cases the amount is quite small, or cooling may be required instead.—A. K. Graham.

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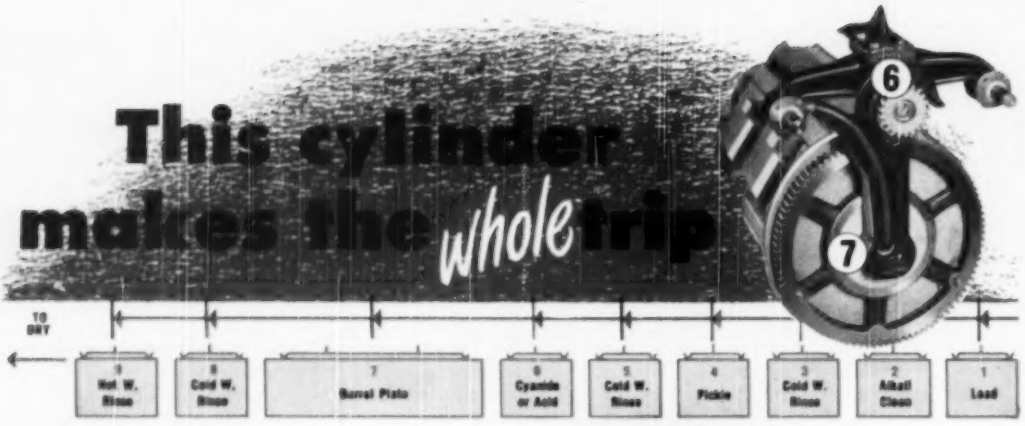

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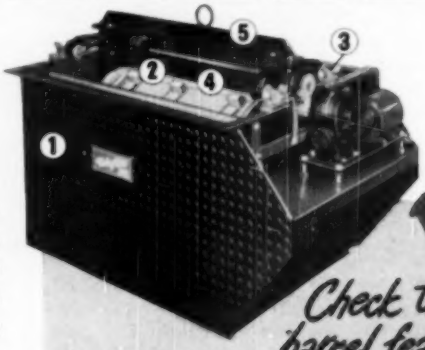

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Book Review

—DR. HAROLD J. READ, *Associate Professor of Metallurgy, The Pennsylvania State College*

PROCEEDINGS OF THE THIRD INTERNATIONAL CONFERENCE ON ELECTRODEPOSITION, September, 1947, 219 pages. The Electrodepositors' Technical Society, 27 Islington High Street, London, N. 1, England. Price, two pounds, ten shillings (approx. $10).

This book consists of the twenty-four papers and discussions thereon which were presented during the course of the Third International Conference on Electrodeposition. Many of the papers are of outstanding interest, and much of the discussion is stimulating. The variety of subjects treated is too extensive to permit reviewing the book as a single entity, and there are more papers than can be discussed individually in the space available. An attempt will be made, therefore, to survey the contents of the book in such a manner that the prospective purchaser will be given some idea of the general technical content.

The first of the four subsections of the volume deals with the electrolytic polishing of metals. Three excellent papers present, respectively, the scientific, technical, and special applications of this process. All of them are quite exhaustive in detail, and when taken together give a refreshing and stimulating resume of what can be done at present and what may be accomplished in the future. Another paper gives an interesting account of the working out of a practical process for the electrolytic polishing of small brass pressings, and very completely indicates the nature and extent of the work involved in translating a laboratory experiment into a production process. The last article in this section, a brief note on motion study and training in metal polishing, is too short and vague to be of much value.

The second section contains papers on miscellaneous processes and reports. A review of chemical treatments for zinc surfaces contains little that is new, but it does delineate the proper field of application for each of the many processes. An article on silver plating in Australia contains some new material of minor interest. A report on the organization of A. E. S. research covers subject matter that is well known to the readers of PLATING. Two papers on European plating practice have nothing to offer which will be helpful to American platers. Internal stress in plated copper from acid baths is the subject of a paper based on extensive experimental work. The effects of several plating factors were evaluated by means of a simple contractometer. Only relative measurements were obtained, and no absolute values of stress were calculated. The final contribution to this section is a short article containing no new material on the porous chromium plating of cylinder bores.

Electrodeposition processes are presented in the third section. In a paper on the throwing power of a commercial (U. S. A.) bath for cadmium deposition, the author is led, on the basis of his measurements, to recommend different operating conditions than those specified by the purveyor. A description of an installation for heavy nickel deposition is a good study of plant design for a particular problem. The deposition of nickel-cobalt, lead-tin, and cadmium-zinc alloys from sulfamate baths is summarized in a concisely written paper. A short article on the technique of plating on magnesium alloys offers much that is discouraging as well as faint promise of success in solving this vexatious problem. The electrodeposition of tungsten alloys containing iron, nickel and cobalt is exhaustively treated in a paper by Brenner et al. A short account of experiences with the Rochelle copper cyanide bath reveals nothing that has not been published in American literature.

The last section of the book is devoted to a most timely subject, namely, the structure of electrodeposits. The influence of the basis metal, particularly with respect to its crystallographic nature, surface condition and method of preparation, is considered in a confusing but thought-provoking paper. A metallographic study of the mechanism of the exfoliation of electrodeposited metals is found in a paper which has appeared elsewhere. A dissertation on the theoretical aspects of tarnishing and related phenomena contains valuable hints which may point the way to interesting practical work in the metal finishing field. The gross structure, particularly with respect to cracking, of thick chromium deposits as related to plating conditions is the subject of an extensively illustrated paper. In an article on brass plating it is claimed that the deposit composition can be completely controlled by variation of only two factors: the copper-zinc ratio in the solution, and the cathode potential. The final paper is an interesting contribution to the growing literature pertaining to the mechanism of bright nickel plating.

With one exception, the discussions for the various papers are gathered together at the ends of the sections. This is a troublesome arrangement for which little justification can be seen.

Although the book is well printed and nicely illustrated, the cheap paper binding is inexcusable in view of the cost of the volume. The cover of the review copy fell off during the first evening of use, and the dried backing glue littered the living room rug to an extent that prejudiced the reviewer's domestic relations.

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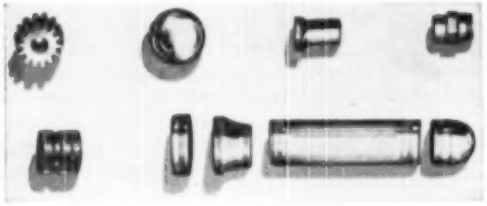

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Article Abstracts

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Diesel Engine Wear Speeded by Surface Disintegration; Slowed by Porous Chrome Plating. Warren G. Payne and William F. Joachim. S. A. E. Journal **56**, 40–43 (July 1948).

According to recent experiments which are described, surface disintegration is an important factor in diesel-engine wear; porous chromium plating protects the surface from it and also from other wear-inducing factors. Metal is lost from the cylinder wall in the form of fine particles by two mechanisms. Data on the wear reduction achieved by chromium plate is charted.

Influence of Crystal Plane and Surrounding Atmosphere on Chemical Activities of Single Crystals of Metals. Allan T. Gwathmey, Henry Leidheiser, Jr., and G. Pedro Smith. National Advisory Committee for Aeronautics, Technical Note No. 1460, June 1948, 67 pages.

Describes method of experiments and gives results of study on influence of crystal plane of single crystals of thirteen metals on rates of chemical processes important to the operation or manufacture of lubricated surfaces. These processes are oxidation in air, corrosion by oils, wetting of the surface by stearic acid, rearrangement and roughening of the surface by action of hot gases, and electrochemical processes including deposition, etching, replacement, and, in a few cases, galvanic action.

Is a Worked Metal Surface Finely Crystalline or Amorphous? Wolfgang Kranert and Heinz Raether. Z. Naturforschung **1**, 512–513 (September 1946).

Electron diffraction pictures of cold-worked surfaces of selenium, antimony and bismuth showed that the resulting structures are crystalline, although the structure is very fine.

Evaluating Hydrogen Embrittlement in Acid Pickling. M. Rosenfeld. Iron Age **161**, 82–87 (June 17, 1948).

Embrittlement effects by hydrochloric and sulfuric acids were evaluated by means of the standard tensile test. The value of immersion in boiling water after pickling and the use of various reagents in the pickling acids are discussed quantitatively. Physical property values indicating the embrittlement effect are correlated with results of visual examination. 11 references.

Metallographic Examination of Surface Layers Prepared by a Polishing Process. H. Klemm. Metall 79–83 (November 1947).

Describes and illustrates methods used to prepare sur-

coated with oxides, sulfides or other forms of corrosion, or with protective films. Includes formula for calculating true thickness of surface films.

Organic Finishes for Metal Products. (Continued.) Steel **122**, 81–84, 100, 103 (June 28, 1948); 97–98, 100, 102, 104 (July 12, 1948).

Part 4 deals with selection and classification of organic finishing materials; primer coatings and their application; and resin baking castings by induction heating. Part 5 reviews properties and applicabilities of amine-formaldehyde resin coatings; melamine, silicone, and alkyd resins; cellulose-base coatings; high-solids metal lacquers and other cellulose finishing materials. (To be continued.)

Life of Fluosilicic Acid-Containing Chromium Plating Baths. Karl Gebauer and Karl Sommer. Metalloberfläche **1**, 25–27 (February 1947).

It is demonstrated that chromium plating baths containing fluosilicic acid are economical and have long life in spite of adverse criticism in the literature. The effect of variation in bath compositions during the useful life is discussed in detail.

The Electrolytic Deposition of Bright Metal Deposits. Part I. General and Scientific Principles. Part II. Bright Metal Baths in Practice. Johannes Fischer. Metalloberfläche **1**, 28–31 (February 1947); 49–56 (March 1947).

A comprehensive literature review including considerable German work. Many bath compositions are given.

Electrolytic Phosphating. Richard Springer. Metalloberfläche **1**, 78–80 (April 1947).

Cathodic phosphating and phosphating with alternating current, as described in German patent literature, are reviewed.

Nature of Hexagonal Chromium and Structure of Electrolytic Chromium Deposits. S. A. Nemnonov. Zhurnal Tekhnicheskoi Fiziki **18**, 239–246 (February 1948).

Critical study of the literature indicates that hexagonal chromium like hexagonal nickel should be considered, not an allotropic modification but a metastable phase. During electrodeposition, with a high degree of dispersion of the newly formed crystal, hexagonal chromium has the lowest amount of free energy. 26 references.

Test of Nickel Plated A. P. I. Type Joint in Flow Line of Corrosive Distillate Well. B. B. Morton. Corrosion **4**, 1–3 (July 1948 supplement.)

The tested joint had two distinctive features: one that the threading of the coupling and the pipe as well as its interior were nickel plated to a depth of about 0.006–0.008 inch, the other that a part of the nickel faces for observation of cross-sectional structure, which is especially useful in the case of specimens

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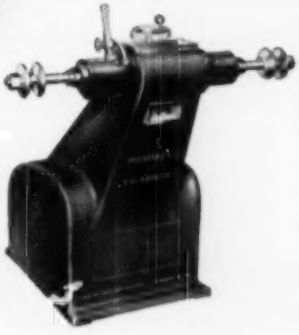

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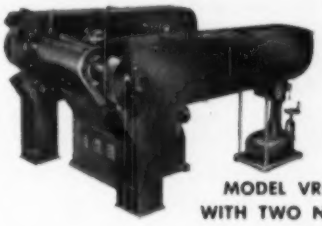

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had been removed from the chamber of the pipe prior to its assembly into the coupling. Severe galvanic corrosion was expected but not observed. It was concluded that rupture of a nickel coating in a condensate well of the type studied will not result in as serious attack as has been previously anticipated. It is also believed that a thin coating of nickel will be adequate to protect the pipe threads.

Hardness and Wear Resistance of Hard Chromium Plates. W. Eilender and H. Arend. Lilienthal-Gesellschaft fur Luftfahrtforschung, Convention of April 30-May 1, 1943; Henry Brutcher, Altadena, Calif., Translation No. 2082, 1948, 6 pages.

Describes an experimental study of hardness as function of plating conditions (current density and bath temperature); relation between current efficiency and plating conditions; hardness as function of plating conditions and subsequent heat-treating ("aging") temperature; influence of heat treating and of thickness of chromium deposits on their hardness; and hydrogen content of chromium plate as function of heat-treating temperatures.

Contribution to the Study of the Morphology of Nonmetallic Inclusions in Ferrous Materials. Inclusions in Commercial Iron. Raffaello Zoja. Metallurgia Ital. **39**, 267-280 (November-December, 1947).

Presents results of an investigation of 99.9 per cent iron produced on a semi-commercial scale with regard to the frequency, distribution, and grouping of the different types of nonmetallic inclusions. Electrolytic, Armco, and "Ferrital" irons were also investigated. Numerous tables and photomicrographs.

Preparation of Metallic Powders by Electrolysis. J. Four Electrique et Industries Electrochimiques **57**, 12-14 (January-February, 1948).

Outlines technique including method for separation of the crystals from the bath. Discusses choice of bath solution and of material for the anode, the cathode, and the diaphragm, also the mechanism of electrolysis.

Measurement of Adherence of Organic Coatings to Metal Surfaces. Henry Green and Theresa P. Lamattina. Anal. Chem. **20**, 523-527 (June 1948).

Describes an apparatus of the knife type which cuts and pushes off a strip of coating of substantial width. The force necessary is calculated in dynes and divided by the strip width to give a ratio called the stripping force per unit width. When this value has been divided by the film thickness, the result is called the intrinsic stripping force. A chart showing the precision of the instrument is included.

Organic Finishes for Metal Products. Steel 122, 77-82 (May 17, 1948); 56-59, 90 (May 31, 1948); 96-98, 100, 102, 104 (June 14, 1948).

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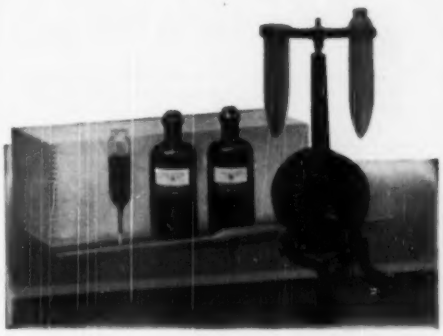

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Changes in the Stress Condition of Surfaces Caused by Etching. F. Lihl. Archiv Metallkunde **1**, 16–25 (October, 1946).

Gives details of systematic research on heated soft-iron specimens, including pretreatment of the specimens and methods of photography; surface stresses caused by use of different etchants and under different conditions; effects of heat treatment; effects of current density in electrolytic etching; superposition of etching stresses on stresses resulting from working or internal stresses; and other factors. Data are tabulated and charted.

Surface Finishing of Aluminum and Its Alloys. Aluminum Development Association (London). Information Bulletin No. 13, December, 1947, 43 pages.

Deals with cleaning and degreasing; mechanical, chemical, and electrochemical finishing methods; and use of paint. Includes working processes such as shot blasting, pattern rolling, and hammer finishing; and also vitreous enamelling and radiant-heat drying. 25 references.

Tin Plating of Electro Shells; Application of Fluoborate Solutions. Clifford Struyk. Electrotypers' and Stereotypers' Journal **12**, 242-244 (May, 1948). Gives detailed directions including bath compositions and preparation, and operating conditions.

Electrolytic Pickling. Konrad Weller. Metal Finishing **46**, 95–102 (June, 1948).

Reviews and evaluates the various methods of electrolytic pickling for scale removal and surface cleaning. These processes, widely used in European countries, are said to be finding ever-increasing application in this country. 17 references.

Mechanism of Electrodeposition of Nickel. IV. Electrodeposition of Nickel During Direct Action of Atomic Hydrogen. G. S. Vozdvizhenski. Zhurnal Prikladnoi Khimii **20**, 1255–1260 (1947).

A method for experimental study is proposed. It is shown that, during electrodeposition of nickel, hydrogen participates directly in the formation of the structure of the electrodeposit.

The Periodic System of the Chemical Elements in Three Dimensions. (The "Five-Five System"). A. G. Oppegaard. J. Chem. Soc. 318–321 (March 1948).

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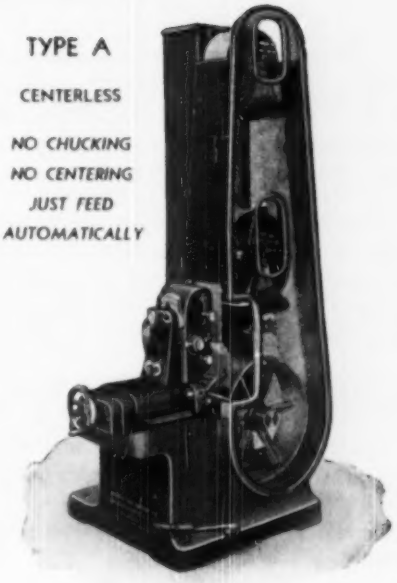

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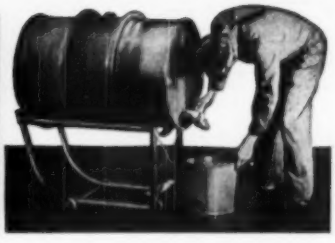

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A new classification of the chemical elements is presented. It is based on an arrangement of the elements in 3 dimensions, and has the following advantages: elements of related chemical properties but with different typical valency are collected into "planes"; elements with same typical valency are collected into "groups"; several weaknesses of the present forms of the periodic system are overcome; it is related to the geochemical distribution of the elements.

The "New Look"; The Impact of Nuclear Physics on Electrodeposition Theories. Metal Industry **72**, 286–288 (April 9, 1948); 326–329 (April 23, 1948). Written in order to stimulate the interests of chemists and engineers in the study of the physical side of the science of electrodeposition, this controversial article gives a picture of the processes involved in electrodeposition when approached from the angle of the physicist.

Electroformed Precision Prisms. Benjamin Goldberg. J. Optical Soc. Am. **38**, 409–412 (April 1948). Gives details of an investigation to determine the feasibility of producing electroformed retrodirective copper reflectors with an accuracy approaching that of the precision-ground trihedral glass prism used as the mold. It was found that the metal prism, although about as accurate as the glass prism at a distance of one mile, was still not as accurate as its mold. However, continued improvement in optical accuracy of the successively manufactured prisms indicates that ultimate accuracy possible by electroforming has not yet been determined. Reflectors produced by electroforming would cost about one-sixth as much as commercially produced glass prisms of the same optical accuracy.

Bonding Aluminum to Ferrous Metals. M. G. Whitfield and V. Sheshunoff. Iron Age **162**, 88–93 (July 1, 1948).
This article discusses processing techniques and design factors in bonding aluminum to ferrous metals by casting operations. A method of assembly in which aluminum sheet is brazed to steel or cast iron parts is also described.

The Adhesion of Enamel Finishes to Electro-Plated Cadmium Coatings. E. E. Halls. Metallurgia **38**, 75–78 (June 1948).
Extensive laboratory tests were conducted on cadmium plated steel panels having various types of enamel finish and on which the cadmium had been given various chemical treatments prior to enamelling. Results are tabulated and discussed.

Peeling and Scaling of Nickel Plating. L. T. Richards. Metalloberflache **1**, 173–176 (July 1947).
Analyzes systematically causes of peeling and scaling of nickel deposits and indicates methods of prevention (To be concluded).

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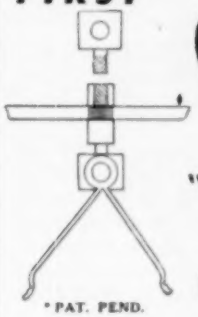

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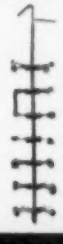

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Strip Tension and Velocity Control. Chris Diechert. Steel **123**, 69–70, 102 (July 26, 1948).
Describes use of the above as key factors in continuous cleaning, plating, and coiling of steel venetian-blind stock.

Electrolyzing Prolongs Tool Life and Protects Wear Parts. Tool and Die J. **14**, 56 (August, 1948).
Outlines new process said to prolong greatly the life of cutting tools, dies, gages, and wear parts. It involves two procedures: a high-frequency treatment which raises the fatigue limit of the tools; and a process of evaporation and condensation by which a 0.00003 to 0.00005 inch layer of a new hard alloy is deposited upon the cutting edges or working surfaces.

Sensitivity of Different Steels to Pickling Brittleness. C. A. Zapffe and M. E. Haslem. Wire and Wire Products **23**, 563–569, 609–612 (July, 1948).
Describes an investigation of the behavior of steels under conditions of cathodic pickling and straight acid pickling. Data charts include descriptive list of steels studied and master charts for comparison of results, using various acids.

Copper Plating as a Surface Protection of Steel. (Concluded.) Hans Broking. Metalloberfläche **1**, 137–139 (June, 1947).
Discusses the precautions to be taken in production of articles of copper-plated sheet steel. Diagrams show methods of preparing the sheets for welding and flanging, and photographs show finished articles made of copper-plated steel.

Electrolytic Tungsten-Cobalt, Tungsten-Nickel, and Tungsten-Iron Alloys. H. Offermanns and M. v. Stackelberg. Metalloberfläche **1**, 142–144 (June, 1947).
Reviews methods of obtaining tungsten alloys by electrolysis and describes in detail a process of making alloys of iron, cobalt, and nickel with a maximum of 50 per cent tungsten. The effect of the *p*H value, temperature and current density, the hardness and corrosion resistance of electrolytic tungsten-cobalt alloy, as well as the crystal structures of these tungsten alloys, are discussed. Data are presented in graphic and tabular form.

Screening at V. H. F. B. Boston. Wireless Engineer **25**, 221–239 (July, 1948).
Describes very high frequency properties of various metallic surfaces which are economic and which may be readily adapted to production. An analysis of the problem of shielding shows that in the case of a receiver, where only the radiation field requires to be screened, a conducting sheet makes an efficient shield. An experimental method has been developed by which the efficacy of various forms of metallic shield may be assessed. Tests upon electrodeposited steel specimens and sprayed-metal specimens have given results which confirm the theoretical deductions and determine the order of their screening efficacy.

Direct Polarographic Determination of Copper and Lead in a Nickel Electrolyte. I. A. Korshunov nd L. N. Sazanova. Zavodskaya Laboratoriya **13**, 621 (July, 1948).
Proposes the polarographic determination of copper and lead in a nickel electrolyte previously treated with small amounts of hydrogen peroxide and sodium to destroy organic contaminants and cause iron to precipitate.

The Proficorder—An Instrument for Recording Waviness and Other Surface Profiles. E. J. Abbott and Edward Rupke. Trans. Am. Soc. Mech. Engs **70**, 263–270 (May, 1948).
The instrument described reproduces, with appropriate magnifications, the actual profile of a considerable length of surface. It permits the study of individual irregularities as to size, shape, and relative position with respect to other irregularities. It can be used for inspection of production setups for waves and other surface characteristics. It is said to be useful for both production and laboratory work.

An Automatic Constant-Level Controller for Low-Boiling-Point Liquids. G. O. Jones. J. Sci. Instr. Phys. Ind. **25**, 239–242 (July, 1948).
Describes and illustrates the above.

Dowex 50, A New High Capacity Cation Exchange Resin. W. C. Bauman, J. R. Skidmore and R. H. Osman. Ind. Eng. Chem. **40**, 1350–1355 (Aug. 1948).
Describes chief attributes of Dowex 50, a new cation-exchange resin of the sulfonated hydrocarbon type.

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New Baby in the Fluorine Family. Ind. Eng. Chem. **40,** 22A, 24A (September, 1948).
Discusses properties and potential applications of a number of salts of fluorophosphoric acid, recently made available in experimental quantities. Applications suggested include cleaning of metals, as electrolytic or chemical polishing agents, or in formation o protective coatings on metals.

Conditions in the Pickling Bath Which Affect Hydrogen Embrittlement. C. A. Zapffe and M. E. Haslem. Wire & Wire Products **23,** 753–761, 792–793 (September, 1948).
Final article of series first describes test procedure, then gives results of investigation of effect of acid type and concentration, of temperature, of promoters, and of inhibitors. Under the latter heading, effect of six commercial pickling inhibitors for stainless steel were studied. Data are charted and a series of conclusions summarized.

Electroforming of Lead-Bronze Bearings. A. Beerwald and L. Dohler. Arch. Metallkunde **1,** 412–417 (September, 1947).
Describes experimental process and equipment for the above, using alkaline tartrate and citrate baths. Critically evaluates the prospects of the process. Charts and tables.

Theory of Anodic Polishing. Jean Mercadie. Compt. rend. **226,** 1519–1520 (May 10, 1948).
Presents a new theory for the above. Emphasizes that introduction of addition agents such as alcohols, anhydrides, etc., results in reduction of the dielectric constant, thus aiding formation of the complexes required for polishing according to the theory proposed.

Pyrophosphate Copper Plating. Anon. Electroplating **1,** 523–526, 534 (August, 1948).
Briefly reviews development of pyrophosphate solutions for the electrodeposition of copper as described by American and Russian workers. The latest development points to the value of nitrate additions in effecting an all-round improvement.

Contribution to the Study of the Electrodeposition of Alloys. Part IV. Roberto Piontelli. Metallurgia Ital. **40,** 3–8 (January-February, 1948).
After a general review of the theory of electrodeposition of alloys as compared to the electrodeposition of pure metals, methods for electrodeposition of alloys using fused-salt baths are described. Composition and structure of such deposits are indicated.

Contribution to the Study of the Electrodeposition of Alloys—Constitution of the Products. Vincenzo Montoro. Metallurgia Ital. **40,** 9–12 (January-February, 1948).
The electrodeposition of nickel-cobalt, copper-tin and copper-lead alloys was investigated. It was found that primary solid solutions, intermediate phases, and mixtures more or less closely associated with one of the alloy components are present. 14 references.

Determination of p-Toluenesulfonamide in Nickel Plating Baths. Julius Sirota. Metal Finishing **46,** 68–69 (September, 1948).
The method described makes use of the chlorination of p-toluenesulfonamide to p-toluenesulfonedichloramide. The amide is then solvent extracted, dissolved in acetic acid and excess potassium iodide solution, and titrated with sodium thiosulfate, using starch as an indicator.

Chemical Stability of Tin Coatings. N. N. Gratsianskii and P. F. Kalyuzhnaya. Zhurnal Prikladnoi Khimii **21,** 341–346 (April, 1948).
Physical and chemical characteristics of electroplated coatings from various baths, especially stannate and sulfate, were studied. Factors influencing their chemical stability are indicated.

Plating Speed and Structure of Hard Chromium Deposits from Baths with Abnormally High Sulfuric Acid Content. R. Bilfinger. Metallwaren-Ind. Galvanotech. **43,** 3–6 (January-February, 1945). Translation No. 2084, Henry Brutcher, Altadena, Calif.
Describes development of a chromium plating practice which gives much higher deposition rates in concentrated sulfuric acid baths than in baths containing 1 to 2 per cent sulfuric acid. Discusses relation between critical current density and foreign acid content and effect of bath temperature on this relation. Includes tabulated data on interrelations between current efficiency, plating speed, sulfuric acid content, current density, and bath temperature.

Smoothness of Hard Chromium Deposits as Influenced by Roughness of Basis Metal. K. Gebauer and K. Sommer. Oberflächentechnik **19,** 41–45 (May, 1942); T. Z. Prakt. Metallbearbeitung **52,** 17–18, 40–42 (January-February, 1942). Translation No. 1994, Henry Brutcher, Altadena, Calif.
An experimental study of best methods of surface preparation for prevention of nodules in hard chromium deposits. Deals with nature of surface roughness and process of formation of chromium plates; conditions under which nodules grow; effect of sharp points or edges; treatment of basis metal surface preparatory to chromium plating, by machining, grinding, brushing, buffing, and pickling; and effect of basis metal, e. g., carbon and alloy steels with different compositions and heat treated in different ways, upon the deposited chromium plate.

Patent Abstracts

By GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

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No. 2,451,340, October 12, 1948—Electroplating—George W. Jernstedt, assignor to Westinghouse Electric Corporation.

This invention relates to the electrodeposition of iron, platinum, osmium, iridium, rhodium, palladium, ruthenium, lead and indium and alloys thereof in which these metals form the predominant constituent by means of periodically reversed electric current.

Periodically reversed electric current enables the electroplater to control and improve the entire plating operation with certain unexpected advantages accruing. It enables the electroplating process to be so carried out that one or more of the following advantages over continuous direct current plating are obtained:

(1) Increase in the rate of plating
(2) Increase in the density of the metal deposited
(3) Improved brightness of electrodeposited metal surface
(4) Greater smoothness in the electrodeposited metal
(5) Heavier deposits are platable
(6) Decreased porosity, and
(7) Improved electrodeposited metal distribution on base members.

CLAIM 1. In the method of electroplating a metal from the group consisting of iron, lead, indium, platinum, osmium, rhodium, iridium, palladium, ruthenium, and alloys in which these metals predominate on a base member from an aqueous electrolyte having the metal to be plated dissolved therein, the steps comprising applying a plating electric current to the base member for a period of time of not more than 40 seconds to electroplate an increment of the metal thereon, then applying a deplating electric current to the base member for a shorter period of time to deplate a substantial portion of the previously plated increment, the deplating electric current being of a magnitude and applied for a period of time sufficient to deliver from 15 per cent to 40 per cent of the coulombs delivered during the preceding plating period, and continuing the alternate plating and deplating until a desired thickness of the metal is applied to the base member.

4 claims, 10 examples of solutions of different metals.

References cited: U. S. Patents 1,215,354; 1,534,709; 1,534,451; 1,565,216; 1,918,605.

No. 2,451,341, October 12, 1948—Electroplating—George W. Jernstedt, assignor to Westinghouse Electric Corporation.

CLAIM 8. In the method of electroplating a metal from the group consisting of copper, brass, silver, zinc, tin, cadmium and gold on a base member from an aqueous cyanide electroplating electrolyte having the metal dissolved therein and in which the base member and an anode of the metal to be plated are immersed, the steps comprising applying a plating electric current to the base member for not less than 2 seconds and not more than 40 seconds to electroplate an increment of the metal, then applying a deplating electric current for a period of from ½ to 10 seconds to the base member to deplate a substantial portion of the preceding increment, the deplating current being of a magnitude and applied for a sufficient period of time to deliver at least 10 per cent of the coulombs delivered during the preceding plating period to effect removal of a part of the previously plated increment, and continuing the alternate plating and deplating until a desired thickness of metal is applied to the base member.

10 claims, 6 figures, 8 examples of solutions used.

References cited: U. S. Patents 1,215,354; 1,534,709; 1,544,451; 1,565,216; 1,918,605; 2,048,578; 2,412,698. Trans. Electrochem. Soc., Preprint 81–20, April 20, 1942, pp. 312–315. "Electroplating", Freeman and Hoppe, 1930, pp. 100–102. "Principles of Electroplating and Electroforming", Blum and Hogaboom, 2nd ed., 1930, pp. 89, 90, 108, 109, 215–217.

No. 2,451,426, October 12, 1948—Bright Zinc Plating—R. R. Bair, H. L. Benner and J. F. Walker, assignors to E. I. duPont de Nemours & Company.

We have discovered that a certain polymeric condensation product of sodium cyanamide and formaldehyde, which is soluble in alkaline solutions having a *p*H above 9 and insoluble in water at a *p*H of 8 to 9, is an excellent brightening agent for zinc plating baths, whether alkaline, acidic or neutral. We have further discovered that when this condensation product is added to an alkaline zinc plating bath which already contains a polyvinyl alcohol addition agent, excellent bright deposits can be obtained over a wide range of current densities at temperatures from 20° C. to as high as 60° C. and even higher. In other words, the addition of the condensation products widens the current density bright range at the higher temperatures.

CLAIM 2. The process of electrodepositing zinc from an aqueous zinc cyanide electroplating solution having a *p*H above 9.0 which comprises electrodepositing said zinc from said solution containing dissolved therein 0.1 to 2.0 ounces of sodium cyanamide and formaldehyde obtained by reacting substantially equimolecular amounts of sodium cyanamide and formaldehyde in aqueous solution at a temperature below 35° C. and about 0.001 to 0.1 ounce per gallon of polyvinyl alcohol.

4 claims, 10 examples of solution composition.

References cited: U. S. Patents 1,791,434; 2,101,580; 2,111,698; 2,171,342; 2,288,318; 2,328,593; 2,411,396; 2,411,397. Metal Industry 443 (November 29, 1940).

No. 2,452,361, October 26, 1948—Method for Electrolytic Deposition of Indium and Bath Therefor.—J. R. Dyer, assignor to The Indium Corporation of America.

CLAIM 3. The method for electrolytic deposition of indium which consists essentially of preparing a bath consisting of indium hydroxide in formamide in an amount between 10 and 100 grams per liter of indium hydroxide in formamide, placing in contact with the resulting solution as a cathode article on the surface of which indium can be electrodeposited, placing an indium anode in contact with said solution, and passing an electric current from said anode to said cathode through said solution to electrolytically deposit indium on the surface of said article.

4 claims.

LEGEND: Using a pure indium anode, a current density of 10 amperes per square foot and a voltage of 6 to 9 volts, this bath showed an anode efficiency of 100 per cent, a cathode efficiency of 95 per cent and a deposition of 21 to 24 milligrams per ampere minute.

References cited: U. S. Patent 2,423,624. Z. Elektrochemie **16,** 422, 427, 435, 436 (1910). "A Comprehensive Treatise on Inorganic and Theoretical Chemistry", J. W. Mellor, vol. 5, 1924, pp. 389, 398. Trans. Electrochem. Soc. **27,** 291, 292, 293 (1930). J. Am. Chem. Soc. **26,** 437, 438 (1904). Metal Finishing 405-407 (July, 1944).

No. 2,445,962, July 27, 1948—Method of Forming Silver Sulfide Coatings—C. W. Mell, assignor to Radio Corporation of America.

There are certain applications where a uniform deposit of silver sulfide upon silver or silver plate is very desirable. For example, in the case of certain electrical apparatus employing silver or silver surfaced conductors through which high frequency currents are passed, it has been found advantageous to provide for such conductors a surface layer of silver sulfide for the purpose of controlling such currents in desired manner.

A solution or emulsion is prepared by dispersing a film-forming water-soluble, waxlike derivate of polyhydric alcohols or film-forming hydrophilic colloid in water with the aid of a wetting agent.

A typical formula is representative.

	Parts
Carbowax 4000	10
Triton N E Special	2
Triethanolamine	2
Water	100

or

Gelatine	5
Triton N E Special	2
Triethanolamine	2
Water	2

CLAIM 4. The method of forming a coating of silver sulfide on an article having a silver surface which comprises first treating said silver surface with a water emulsion of a film-forming hydrophilic substance, then drying the treated surface, and then placing said article in an enclosure containing a solution of approximately 500 ml of water for every cubic foot of air in said enclosure and saturated with hydrogen sulfide whereby to subject said treated surface to humid hydrogen sulfide fumes emanating from said solution, and retaining said article in said enclosure until a desired coating of silver sulfide has formed on said surface.

5 claims.

References cited: U. S. Patents 2,079,690; 2,339,200.

No. 2,446,060, July 27, 1948—Chemical Polishing of Metal Surfaces—A. H. Pray, I. Igelsrud and G. L. Simard, assignors by mesne assignments to Battelle Development Corporation.

CLAIM 4. A bath for chemically polishing metals consisting essentially of nitric acid, acetic acid, phosphoric acid and water, in amounts varying from 10 to 50 per cent commercial nitric acid having a specific gravity of about 1.42; from about 10 to 80 per cent glacial acetic acid having a specific gravity of about 1.05; from about 10-80 per cent commercial phosphoric acid having a specific gravity of about 1.7; and up to about 10 per cent water, said percentages all being by volume.

8 claims, 1 figure, 16 examples.

LEGEND. The metals that can be treated in this solution consist of German silver, copper, brass, nickel and Monel.

References cited: U. S. Patents 1,186,837; 1,919,624; 1,939,241; 2,070,487; 2,172,171; 2,238,778. British Patents 174,489; 489,211.

No. 2,453,481, November 9, 1948—Anode for Electrolytic Coating—A. B. Wilson, assignor to National Steel Corporation.

CLAIM 1. In an electroplating apparatus wherein a plurality of anodes are disposed in spaced, side-by-side relation in a bank in an electroplating bath, the combination of a plurality of anode bars and spaced guides in said bath for supporting the anode bars and over which they may be moved, one of said guides being an electrical contact member for supplying current to the anode bars, each anode bar comprising an elongated body portion, the cross section of which is quadrilateral, and quadrilateral end portions adapted to ride on said guides, said end portions being of greater cross-sectional area than and extending laterally beyond said body portion, and having coplanar face parallel to the axis of the body portion, the faces of the end portions resting on the guides together

with the corresponding faces of adjacent anode bars, substantially completely covering the portions of the guides traversed by the anode bars as they are moved there along.

2 claims, 6 figures.

References cited: U. S. Patents 226,616; 1,313,246; 1,478,853; 2,312,452; 2,399,254.

No. 2,453,668, November 9, 1948—Electrolytic Method for the Production of Porous, Clalytic Metal—M. M. Marisic and Thomas F. Rutledge, assignors to Socony-Vacuum Oil Company.

This invention relates to a porous adherent metallic body produced by electroplating and to the process of electroplating by which such body is produced.

EXAMPLE III

A tough, porous, adherent nickel plate was formed by plating from a bath at a current density which produces a smooth plate, and simultaneously impressing sudden surges of exceedingly high voltage on the cell at short intervals of time. This may be accomplished by plating under the following conditions:

Current density	1.5 amp/dm² (14 asf)
*p*H	4.6–5.5
Agitation	slight
Weight of plated metal	0.35 gram
Time of plating	2 1/3 hours
Surges of overvoltage	75 to 80 volts, at intervals of 0.5–1 sec.

Concentration of plating solution

0.30 *N* $NiSO_4$

0.03 *N* NH_4Cl

0.03 *M* H_3BO_3

The overvoltage surges are obtained by a suitable timing arrangement. The positive pole of the high voltage source is connected to the positive pole of the plating cell. The effect of the surges of high voltage is to produce a very large number of tiny hydrogen bubbles which cause the plate deposited by the steady lower current to be porous. This plate was a very active catalyst for the reduction of C_2H_4.

CLAIM 1. The process for producing a porous catalytic metallic body consisting of a plurality of alternate layers of dense and porous nickel, which consists in the electrodeposition of nickel by imposing a current having a density of approximately 1.5 amperes per square decimeter across the electrode of an electrolytic bath of 0.30 *N* nickel sulfate having a *p*H between 4.6 and 5.5, maintaining substantially room temperature, to effect the deposition of a smooth, dense layer of nickel, simultaneously imposing from a high voltage source, the poles of which are connected to poles of like charge of said electrolytic cell, sudden surges of overvoltage of between about 75 and 80 volts at intervals of between about $\frac{1}{2}$ and 1 second between imposition of said overvoltage, to effect the deposition of a porous nickel layer, thereby effecting, as a result of said surges of overvoltage upon the steady lower current, an alternate deposition of smooth and porous layers of metallic nickel to yield a resulting composition characterized by high structural strength.

2 claims, 2 figures, 7 examples.

References cited: U. S. Patents 485,343; 585,359; 1,151,003; 1,527,734; 2,026,466; 2,046,440; 2,098,960; 2,116,927; 2,138,881; 2,206,908; 2,297,817; 2,387,772. British Patent 23,347.

No. 2,453,757, November 16, 1948—Process for Producing Modified Electronickel—I. S. Rezoni, assignor to International Nickel Company.

4 claims, 2 figures, 9 tables.

The present invention relates to the production in situ of electrodeposited nickel containing sulfur and, more particularly, to the production in situ of electrodeposited nickel containing sulfur and suitable for use as anode in the electroplating of protective and/or decorative coatings of nickel electroplate.

CLAIM 2. A process for producing electronickel having a good activity as anode up to *p*H 5.5 Q (Quinhydrone electrode) in nickel electroplating baths and corroding as anode at *p*H up to 5.5 Q without the production of undesirable amounts of loose nickel and sludge, which comprises purifying an electrolyte containing nickel and at least one of the group of impurities consisting of copper, iron, arsenic and lead to obtain a purified electrolyte substantially devoid of said impurities, positively introducing an effective amount of an electrolyte-soluble sulfur-bearing compound selected from the group consisting of sulfur dioxide and sulfites and acid sulfites of the alkali metals and alkaline earth metals into said purified electrolyte, electrodepositing nickel from said purified electrolyte to obtain electronickel containing about 0.005 per cent sulfur to about 0.03 per cent sulfur, and subjecting said electronickel to heat treatment at a temperature of about 1500° F to about 1800° F in a non-oxidizing atmosphere for about 20 minutes to about 30 minutes.

References cited: U. S. Patents 90,332; 1,750,092; 1,941,257; 2,001,395; 2,11 ,818; 2,115,019; 2,304,059; 2,385,269; 2,392,708. Modern Electroplating (1942), pp. 242–243. Metal Industry, pp. 141–144 (January 22,1937). Circular of Bureau of Standards No. 100 (1924), pp. 6 and 9.

No. 2,454,142, November 16, 1948—Electrolytic Recovery of Zinc—John T. Ellsworth.

Excerpt from legend: "... the removal of these harmful salts by evaporation of a small percentage of the purified pregnant solution promotes the precipitation of copper and cadmium as well as filtering."

CLAIM. In the method of recovering zinc from zinciferous materials involving the treatment of the zinciferous material with a cyclic acid zinc sulfate solution and electrodeposition of zinc therefrom, the improvement in reducing prior to electrodeposition the concentration in the solution of soluble salts which exercise harmful effect during electrodeposition when

present in too high a concentration, which comprises withdrawing and evaporating to substantial dryness from about 3 to about 10 per cent of the solution, in the course of which a substantial part of the harmful soluble salts therein is rendered insoluble without materially impairing the solubility of the zinc therein, leaching the dried residue of said evaporation with water to dissolve zinc sulfate therefrom, separating the dissolved zinc sulfate from the solid residue, and returning the separated dissolved zinc sulfate to the cyclic solution.

1 claim.

References cited: U. S. Patents 1,154,602; 1,167,701; 1,241,966; 1,429,330; 1,843,606. British Patent 15,546. German Patent 361,258.

No. 2,454,935, November 30, 1948—Continuous Wire and Strip Electrodepositing Machine—C. G. Miller, assignor to the Meaker Company.

CLAIM. Apparatus for electroplating simultaneously a plurality of strips comprising a tank containing electrolyzing solution, a plurality of fixed soluble anodes in said solution, means for moving said strip through the solution, and means for maintaining a relatively constant distance between said strips and anodes, said last mentioned means comprising a frame including an upper and a lower rod extending in parallel relationship across said tank, said lower rod comprising a supporting member located beneath the strips and adapted to be located beneath the surface of the electrolyzing solution and supporting said strips in parallel relationship, said frame having means for adjusting said lower rod and the strips supported thereon toward said anodes as said anodes become smaller, a plurality of conducting fingers swingably mounted on said upper rod and yieldably held in contact with the strips, and an insulating sleeve mounted on each of said fingers, said means for maintaining a relatively constant distance between said strips and anodes including brackets mounted on the tank sides, vertically mounted screws and nuts mounted on said frame, said screws extending through said brackets and supported thereon, a pair of arms forming parts of said frame and extending downwardly on the opposite sides of the tank and connecting together in rigid relationship said upper and lower rods for adjustably maintaining the position of said frame, including said lower rod, and guides on the opposite vertical side of said tank for guiding said pair of arms, said lower rod and said conducting fingers and for opposing the frictional drag of said strips on said fingers and lower rod, said arms serving to maintain the proper distance between the lower ends of said fingers and said lower rod.

1 claim, 1 figures.

References cited: U. S. Patents 667,198; 1,515,092; 1,803,691; 1,953,484; 1,991,817; 2,229,423; 2,312,452; 2,338,795; 2,378,002. British Patents 11,547, 21,081; 22,543. German Patent 165,875.

Precious Metal Alloys

(Continued from page 49)

DEPOSITION OF PALLADIUM ALLOYS FROM CHLORIDE BATHS

A good deposit analyzing 78 per cent platinum and 22 per cent palladium was obtained from a bath containing 8 g/l platinum, 2 g/l palladium, 500 g/l lithium chloride and 40 ml/l 28 per cent hydrochloric acid at 2 asf and 200° F.

An excellent gray-white plate containing 20.4 per cent silver, 25 per cent platinum and 53.4 per cent palladium was deposited under the same conditions from a similar bath containing 2, 5, and 14 g/l of palladium, platinum, and silver, respectively.

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Equipment and Supplies

E—198. Non-sludging Phosphate Treatment—"Banox", described by the manufacturer, Calgon, Inc., as an amorphous metaphosphate compound, has been in use at Jones & Laughlin Steel Corporation's Aliquippa (Pa.) wire mill since June, 1947 to help in wire-drawing and found to permit a 20 to 25 per cent increase in speed of drawing fine high-carbon wire. It has also been effectively employed by manufacturers of household appliances, metal furniture, and automotive bodies and parts as a rustproofing and paint-bonding coating prior to painting.

Protection of the wire against rusting while in process not only has permitted an increase in drawing speed but also has meant a sharp reduction in damage to dies and to wire, and fewer delays for replacing and restringing dies, Jones and Laughlin metallurgists have explained.

The coating deposited by a Banox solution is said to be an amorphous or

non-crystalline phosphate with a physical structure much like that of high-polymer resins. It follows the profile of the metal surface in an even and continuous film approximately 15 millionths of an inch thick, imparting no roughness and retaining its flexibility so that it does not crack or flake in further processing of the wire or other metal product or part. Heat is not required for application, nor is special equipment. Both spray and immersion methods are being employed. A maintenance problem common to most phosphate coating solutions is eliminated because the Banox solution does not produce a sludge in the tank.

E—199. Wet-Blast Metal Cleaning and Finishing Machine—Armstrong Chemical and Machine Company, Painesville, Ohio, announces the new "Jet Blast" machine for wet abrasive blast cleaning and finishing of metal surfaces. The siphon-jet principle is used for transferring the grit slurry, thus eliminating pumps or moving parts coming into contact with the abrasive liquid. The only wearing parts are the blast nozzles. The large permissible variation in abrasive size, 60 to 1250 mesh, makes it commercially possible to produce matte finishes as low as 2–3 microinches rms with practically no removal of metal, it is said.

Specifications of standard models are: 30 x 30 x 77 inch high cabinet with one blast nozzle and exhaust blower directly

connected to a ¼ hp motor, and 48 ¼ 42-x 108 inch high cabinet with one to eight blast nozzles and exhaust blower directly connected to 1 hp motor. Cabinet and frame are water-tight welded steel construction. Each machine is a self-contained unit, completely fitted for connection to the shop compressed-air lines.

Typical applications of the "Jet Blast" cleaning method are removal of rust, mill scale and heat treating scale; cleaning of forging dies and metal molds; honing of metal cutting tools; and preparation of metal parts for plating, painting, or enameling. For further information, use Reader Service Card.

E—200. Air Compressor That Can "Grow"—Air-Flo Compressor Company, Akron 7, Ohio, has just announced a new basic compressor, on which patent applications are pending, which uses 18 principal parts to construct a line of 46 different models of 1, 2, 3, 4 or 6 cylinder pumps in single or two stage types and is said to represent the largest number of models ever made from one standardized

set of parts. Since all parts are interchangeable, it is quite practicable to purchase the size pump suitable for immediate needs and, as requirements for air expand, to buy additional parts to increase the compressor's capacity or pressure.

Complete interchangeability permits carrying a small basic inventory of replacement parts instantly available for any Air-Flo Compressor in the plant, regardless of size or model. Compressors are available for prompt shipment in sizes from ½ to 40 hp with 2.5 to 275 cfm capacity at 30 to 300 psi pressure in vertical, V-type or side-angle construction, with single, twin, or radially staggered cylinder arrangements. For further information, use Reader Service Card.

E—201. Water Demineralizer—Penfield Manufacturing Co., Inc of Meriden, Conn. announces a new cartridge-type water demineralizer especially designed for the metal finishing industry to convert ordinary tap water to the chemical equivalent of distilled water at a very low cost.

Faucet water passes through a series of four beds of ion exchange resins in which sodium, potassium, calcium, magnesium, iron, copper, lead, etc., as well as sulfates, carbonates, chlorides, etc., are removed.

The demineralizer consists of a wall bracket, the renewable resin cartridge, and an electrical resistance indicator which shows when a new cartridge is needed. For further information, use Reader Service Card.

E—202. Zinc Bright Dip—Allied Research Products, Inc., 4004 E. Monument Street, Baltimore 5, Md., has announced a new Iridite Bright dip designed especially for use in automatic zinc plating installations. A variant of the standard Iridite Bright, this new formulation makes it possible to obtain a bright chromate film using as few as three stations after plating. Nitric acid is used along with an equal part of Iridite Bright concentrate, to replenish the working solution and keep *p*H at proper operating levels.

The salt spray corrosion resistance obtained under production conditions is normally from 24 to 48 hours for the bright, clear Iridite film, increasing upwards to 100 hours as iridescence is increased. Cost under production conditions is said to range from $0.0015 to $0.002 per square foot of surface treated. For further information, use Reader Service Card.

E—203. Electroformed Nickel Foil—Chromium Corporation of America, Waterbury, Conn. now manufactures electroformed nickel foil in continuous strip, 40 inches wide and 0.0003 to 0.005 inch thick. The foil is very pure nickel of high ductility. Prospective users may obtain further information by indicating their problems on the Reader Service Card.

E—204. Intercommunication from High Noise Level Areas—A new intercom circuit which makes it possible to answer paged messages areas clearly and intelligibly from high noise level, has been

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Equipment and Supplies

introduced by Executone, Inc., 415 Lexington Ave., New York 17, N.Y. This new circuit combines the coordinated operation of a trumpet-type paging reproducer and two-way staff station for use in either intercommunication or sound systems.

Heretofore, when replies were made through a two-way trumpet reproducer in a noisy location, the trumpet would pick up and transmit to the calling station all the shop noises so that the reply message was frequently unintelligible and created a disturbing blast at the station where the call originated. With this new circuit, the page message is reproduced at high volume through the trumpet station. To reply, the person called merely depresses a lever on the nearest conveniently located staff station, the trumpet is automatically cut out, and two-way conversation at normal voice level can be carried on between the person paged and the originator of the call. For further information, use Reader Service Card.

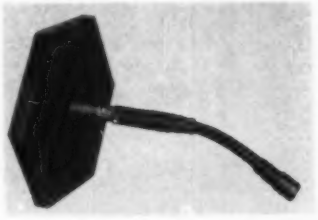
E–205. New Line of Baking Synthetic Enamels—The Organic Coatings Division of United Chromium, Inc., 51 E. 42nd Street, New York 17, N.Y. has announced the addition of a line of baking synthetic enamels to its line of Unichrome Product Finishes. A sizable group of formulations has been field tested for more than two years, and by modification these formulations are said to be made suitable for almost any product, application technique, or baking cycle. Included in the line are enamels based on urea-alkyds, vinyls and highly specialized resins. The enamels are stocked in white, tinted whites, and black, and may be obtained in special colors on order. For further information, use Reader Service Card.

E–206. Steam-cleaning Gun—Oakite Products, Inc., 140 Thames St., New York 6, N.Y. has announced the addition to the company's line of steam-cleaning equipment of the Oakite Solution-Lifting Steam Gun, Model 481, designed to facilitate volume cleaning operations in industrial plants.

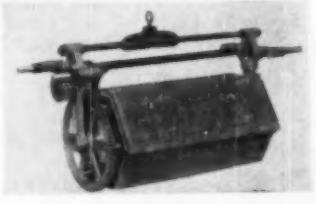
The gun is said to be ruggedly constructed and so balanced that it may be used over extended periods without tiring the operator. Two spade-type, insulated handles are provided on the gun. The forward handle of the gun remains stationary in the operator's grasp as the gun is rotated, while the rear handle is easily turned to rotate the gun when cleaning "underneath" and hard-to-reach surfaces. Steam and solution hoses are connected by swivel joints and remain stationary when the gun is rotated, thus eliminating twisting of hose lines. For further information, use Reader Service Card.

E–207. Improved Plating and Cleaning Barrels—The Hanson-Van Winkle-Munning Co., Matawan, N.J., has announced a number of changes and improvements in the line of Mercil barrel plating equipment which were described in its catalogue, No. PB–107.

These include a return to vulcanized rubber linings and green rubber cylinder parts which were unavailable during and following the war, increase in width of



tanks to facilitate handling of cylinders, improved overflow, for better disposal of rinse water and an additional inch of



rubber on the face of the overflow for greater protection against damage, stop collars on hanger pins for better positioning in rubber-lined tanks, and flexible

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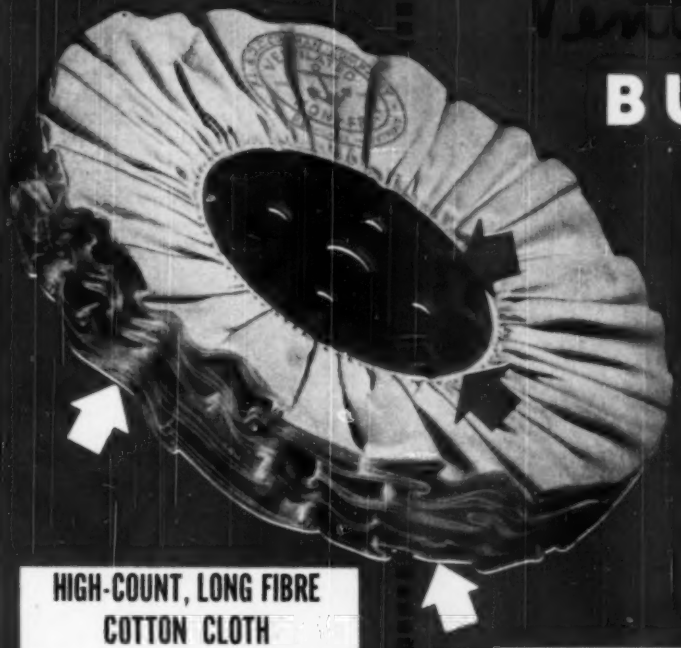

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Deep, non-compressible ventilating channels keep the REAL-VENT cool at all speeds. Cool buffs WORK LONGER AND MORE EFFICIENTLY.

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dangler contacts without metal trunnions, with the cylinder rotating on Merlon bearings.

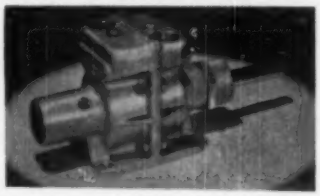
Monel cylinders are now supplied with shaft, hanger arms and gears of monel instead of phosphor bronze which is less satisfactory in acid solutions.

In the oblique barrels the bushing on the drive shaft has been replaced with a roller bearing for less shaft wear and greater barrel strength, the gear housing has been simplified for reduced maintenance, a new channel base has been constructed for greater stability and strength, and the covering on cylinders is now vulcanized rubber.

E—208. Waterless Hand Cleaner—A new waterless cleaner for the removal of grease, dirt and grime from hands in one application is now being manufactured by Schaffner Industries, Inc., of Pittsburgh 2, Pa. Called "Little Doc" Disdvit, it is said to remove grease, dirt, paint, rubber cement, lipstick, tar, asphalt, shellac, carbon, tinners dope, buffing compound and all similar substances without irritating the skin.

One of the essential ingredients is lanolin which protects sensitive skin. It is entirely free from skin-drying ammonia. Disdvit is available in pints, quarts, gallons, and five gallons. For complete information, use Reader Service Card.

E—209. Gearless Liquid Pump—A gearless pump for the industrial handling of liquids has just been announced by Eco Engineering Company, 12 New York Avenue, Newark, 1 N. J. Chief feature is a new dual eccentric piston design which



gives a strong flow against pressure. Pump body is of sturdy naval bronze forgings or stainless steel precision castings. Pump is said to be quiet and smooth running.

Available in four sizes, ¼, ⅜, ½ and ¾ inch, these Eco gearless pumps have capacities ranging from one to twelve gpm varying with pump speed. Pumps are available for use against pressure ranging from zero up to 100 psi. They can be run and will deliver at speeds from 200 to 2400 rpm. For further information, use Reader Service Card.

E—210. Fastening Pipe Hangers to Concrete or Metal—To eliminate star drilling and insertion of toggle or anchor bolts, Mine Safety Appliance Co., Pittsburgh, Pa. has developed a powder-actuated driver that will "pin" a pipe hanger to a concrete ceiling or wall, steel I-beam or column, in a few seconds. It also fastens wood to concrete or steel.

The small, portable tool embeds studs in steel or masonry by the discharge of a blank cartridge. Once embedded, the studs have high holding power of up to several thousand pounds. Two diameters of studs—⅜ inch and ¼ inch—may be used by interchanging the barrels of the tool. There are several varieties of studs available—externally or internally threaded or plain, headed types. For further information, use Reader Service Card.

E—211. New Taber Abraser—Model No. 100–109 is a new addition to the Taber line of standard rub-wear abrasion testers producing rotary abrading action on a

4 inch specimen. The wear results from alternately rubbing the flat faces of two resilient Calibrase wheels over the surface being tested. A range of standardized abrasive wheels are available for testing all types of surface finishes, including

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electroplate, porcelain enamel and organic coatings.

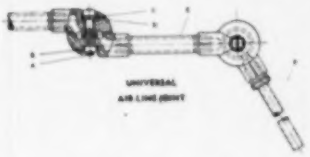
New features provided by the manufacturer, Taber Instrument Corporation, Dept. PI., 111 Goundry Street, North Tonawanda, N. Y., include improved suction pump with vertical dust receiver with swinging nozzle fully adjustable for any thickness specimen. Since different materials require different degrees of suction cleaning while being tested, the control unit is equipped with a built-in variable transformer for adjusting the speed of the suction turbine motor. The control panel is equipped with an adjustable timer which provides a test period of 1000 cycles or less followed by automatic shut-off power to permit the operator to tabulate results or prepare new specimens while the test is in progress without overrunning. For further information, use Reader Service Card.

E—212. Automatic Spray Gun—The AGA Gun manufactured by De Vilbiss Company, 300 Phillips Avenue, Toledo 1, Ohio, is built for adaption to any type of spray finishing machine. It is small in size (7 inches long), light-weight (2¾lb), and can be supplied with mounting adapters that permit tipping and turning it to any position. With interchangeable air caps and fluid tips it is said to be adaptable to the most delicate or the heaviest types of product finishing.

The fast action allows the gun to open, spray, and close completely 5400 times per hour. It is controlled entirely by an air operated piston. The construction is said to provide positive, leak-proof shutoff of fluid and air at the end of each spraying cycle. For further information, use Reader Service Card.

E—213. Improved Airline Filter—The bowl of the M-B Automatic Airline Filter manufactured by M-B Products, 130 E. Larned Street, Detroit 26, Mich., is of transparent plastic and, as a consequence, the filtering element and foreign matter (such as water, oil, scale, dirt, etc.,) filtered from the air is clearly visible, eliminating guess work in timing the cleaning of the filtering element. The plastic has a temperature resistance up to 150° *F* and a burst test of 500 psi. The ribbon-type filtering element functions on the edge filtration principle and removes solids 10 microns and larger. Dirt can be removed from edges of the element by removing a vent plug from the head and opening the drain cock in the bottom of the bowl when air can be used to blow out nozzle. The base and bowl can be removed by loosening one nut, and the filtering element taken out by removing another nut. For further information, use Reader Service Card.

E—214. Universal Air-Line Joint—The new Universal Air-Line Joint manufactured by Universal Air-Line Joint Manufacturing Co., Lafayette, Ind., is said to fill a need in many plants for directing and maintaining a jet of liquid or air to any



point or object. Its use eliminates the frequent adjustment necessary when using make-shift pipe fitting assemblies or semi-rigid tubing, which constantly change position due to machine vibration. It swivels a full 360° and is light in weight, only 3 oz. For further information, use Reader Service Card.

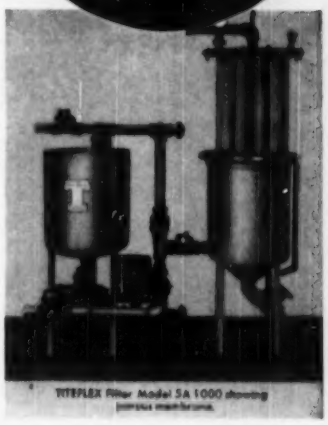
E—215. Improved Dewpointer—Three advantages are claimed for the Alnor Dewpointer manufactured by Illinois Testing Laboratories, 420 N. La Salle Street, Chicago 10, Ill.: first, the monometer scale has been made longer to increase the ease and accuracy of reading; second, thermopiles now measure the temperature inside the observation chamber; third, the resistance thermometer tells when the temperature of the gas sample has stabilized the temperature of the fog chamber. For further information, use Reader Service Card.

E—216. Polishing Lathe for Large Round Parts—Developed originally for polishing large glass molds, the Variable Speed Lathe (VA4BC-A) manufactured by Schauer Machine Co., 2115 Reading Road, Cincinnati 2, Ohio, is being used where large, round parts must be polished, deburred, or otherwise finished. The part to be finished is held on the spindle by a chuck, faceplate, or special fixture and revolved at the speed best suited to the part and the nature of the operation.

Spindle speeds in a ratio of 6:1 from 100 to 4800 rpm are obtainable when a single-speed motor is used. This increases to 12:1 when a two-speed motor is used. For further information, use Reader Service Card.

E—217. Pocket Microscope—The pocket microscope manufactured by Buhl Optical Co., 1009 Beech Avenue, Pittsburgh 12, Pa. adjusts to 40X, 50X and 60X. No larger than a fountain pen, it draws out the eyepiece end for power adjustment and carries a hooded reflector and a knurled collar for fine focusing at the object end. Other features include fully corrected achromatic objective, integral reflecting mirror, built-in vernier focusing, Huygenian eyepiece, satin chrome finish, 20mm focal length.

Fast cleaning time



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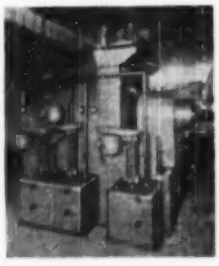
Trade Literature

L—156. Condensate Booster System—Cochrane Corporation, 17th Street and Allegheny Avenue, Philadelphia 32, Pa., has released a 4-page specification bulletin on the new "CBA" high-differential, high-pressure condensate return system applied to steam processing equipment. In addition to material and operating specifications capacity ratings are given for the six different sizes available. For your copy, use Reader Service Card.

L—157. Small-Parts Automatic Processing Machine—N. Ransohoff, Inc., 16 E. 72nd Street, Cincinnati 16, Ohio, has issued a multicolored 4-page bulletin describing its new Ransomatic. Each operation is independently adjustable for a duration of 0 to 30 minutes and the



entire process for 5 to 60 minutes. The parts stay in the treatments drum while the treatment solutions change according to preset cycle, one after the other. The materials of construction depend on the user's requirement and may be moly-bearing stainless steel or steel surfaced with vulcanized rubber. For your copy, use Reader Service Card.

L—158. Water-soluble Cutting and Coloring Compounds—Special Chemicals Corporation, 30 Irving Place, New York 3, N. Y., has issued a bulletin describing its line of Water Soluble cutting and coloring compounds.

Of paramount interest to polishers is the fact that these water-soluble red rouges and tripoli minimize cleaning problems and that the grain size of the abrasives are scientifically controlled. Having had a long period of industrial acceptance, they are ready for immediate full production use, it is said. For your copy, use Reader Service Card.

L—159. Protective Coatings—A new 4-page bulletin on Ucilon Protective Coatings introduces the latest developments in the line manufactured by United

A. S. T. M.-A. E. S. SPECIFICATIONS FOR PLATED COATINGS

All numerical requirements refer to minima on significant surfaces.

Zinc on Steel: A164

Coating	Type G.S.	Type L.S.	Type R.S.
Zinc, inch	0.001	0.0005	0.00015

Cadmium on Steel: A165

Coating	Type N.S.	Type O.S.	Type T.S.
Cadmium, inch	0.0005	0.0003	0.00015

Nickel-Chromium on Steels: A166

Coating	Type D.S.	Type F.S.	Type K.S.	Type Q.S.
Copper plus nickel, inch	0.0020*	0.00125	0.00075	0.0004
Final nickel, inch	0.0010	0.0006	0.0004	0.0002
Chromium (if required), inch	0.00001	0.00001	0.00001	0.00001
Resistance to standard salt spray, hours without appreciable corrosion	96	72	48	16

*When copper is used in excess of a thickness of 0.0001 inch, its minimum thickness shall be 0.00075 inch.

Nickel-Chromium on Copper and Copper-Base Alloys: B141

Coating	Type F.C.	Type K.C.	Type Q.C.
Nickel, inch	0.0005	0.0003	0.0001
Chromium (if required), inch	0.00001*	0.00001	0.00001

*Max. thickness should be kept below 0.00005 inch to prevent cracking.

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Nickel-Chromium on Zinc and Zinc-Base Alloys: B142

Coating	Type F.Z.	Type K.Z.	Type Q.Z.
Copper plus nickel, inch	0.00125	0.00075	0.0005*
Copper, inch	0.0004	0.0003	0.0002
Final nickel, inch	0.0005	0.0003	0.0003
Chromium (if required), inch	0.00001	0.00001	0.00001
Resistance to standard salt spray, hours without appreciable corrosion	48	32	16

*Total of 0.0003 inch if alternative of nickel only is used.

Lead Coatings on Steel: B200

Type	Copper inch	Lead inch	Salt spray Resistance* hours
E.S.	.....	0.0010	96
EE.S.	0.000015	0.0010	96
M.S.	.....	0.0005	48
MM.S.	0.000015	0.0005	48
P.S.	.....	0.00025	24
PP.S.	0.000015	0.00025	24

*To standard salt spray test in hours without appreciable corrosion.

Chromate Finishes on Zinc: B201

With two crossing, 1-inch long scratches through the chromate coating only, the part shall show no white corrosion visible to the unaided eye at normal reading distance after 24 hours in a standard salt spray test.

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Trade Literature

Chromium, Incorporated, 51 E. 42nd Street, New York 17, N. Y. Each coating and its proper application is listed. Typical case-histories are presented to show how the specialized coating systems provide an answer to many serious corrosion problems. For your copy, use Reader Service Card.

L—160. Metal Preservation—American Chemical Paint Company, Ambler, Pa., offers a set of seven new ACP folders on metal preservation and paint durability on metal. They include "Alodine" (Protects Aluminum, Anchors the Finish); "Deoxidine" (Destroys Rusters, Bonds Paint to Metal, Removes Rust); "Duridine" (The Modern Metal Cleaner and Conditioner); "Cold Spray Granodizing" (The Protective Zinc Phosphate Coating Process for Steel); "Lithoform" (Makes Paint Stick to Galvanized Iron); "Rodine" (Efficient and Economical Pickling with "Rodine"); "Thermoil-Granodine" (For Unexcelled Protection Against Rust and Wear).

Each folder describes a specific metal-treatment briefly and thoroughly. Illustrations help the reader visualize various phases of product and process. For your copy, use Reader Service Card.

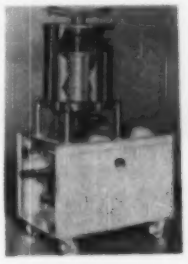
L—161. Buffers, Polishers and Grinders—A 4-page profusely illustrated Bulletin 112, issued by The Standard Electrical Tool Company, Dept. PL, Cincinnati 4, Ohio, describes the company's full line of ball-bearing equipped lathes. It also serves as a price list. For your copy, use Reader Service Card.

L—162. Tumbling Barrels—A new 12-page bulletin 590 gives complete information on barrels for deburring, burnishing, cutting down, drying, and tumbling manufactured by the Belke Manufacturing Company, 947 N. Cicero Avenue, Chicago 51, Ill. It tells how they reduce finishing time, produce a more uniform finish with fewer rejects, and effect substantial savings in labor. For your copy, use Reader Service Card.

L—163. List of Bureau of Standards Publications—Circular 460, "Publications of the National Bureau of Standards", listing all Bureau publications from 1901 to June 30, 1947, has just become available.

Bureau publications listed in the Circular include Mathematical Tables, Building Materials and Structures Reports, Circulars, Handbooks, Commercial Standards, Simplified Practice Recommendations, Research Papers, and Miscellaneous Publications. Brief abstracts for the publications issued from January 1, 1942 to June 30, 1947, are also included. The 375-page publication can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a cost of 75 cents a copy.

L—164. Positive-Seal Cylinder-Type Disk Filter—The Ertel Engineering Corporation, Kingston, N. Y., in a 4-page bulletin, announces the development of a new Positive-Seal Cylinder-Type Disk Filter to be known as Model ECD which incorporates a new principle of double



closure to insure a positive seal. The filtering elements are tightened independently from the cylinder, which is said to permit the use of various types of rigid filter media in any number up to the rated capacity of the filter. After the filtering elements have been sealed, the outer cylinder is closed by a separate handwheel.

Because of the principle of enclosure there is no loss of liquid due to evaporation or drippage, a feature which makes the filter adaptable for handling volatile liquids. There is no by-passing of unfiltered liquids.

The filters are used for plating solutions such as copper, nickel, chromium, tin, etc. For your copy, use Reader Service Card.

L—165. Silicones—A new 32-page data bulletin on silicones by General Electric has been released by the Chemical Division, General Electric Company, Pittsfield, Mass. The introduction contains background studies on silicones, while the general index of chapters conveys to prospective users the comprehensive scope of this compilation: Dry-Film Water Repellants; Silicone Resins for Electrical Insulation; Silicone Resins for Protective and Decorative Finishes; Silicone Rubber; Silicone Oil; Silicone Greases; Silicone Plastics; Miscellaneous Compounds. For your copy, use Reader Service Card.

L—166. Spray Booths—Schmieg Industries, Inc., 325 Piquette Avenue, Detroit 2, Mich., has issued a 12-page catalogue 480, "Centri-Merge Spray Booths", describing the equipment and furnishing layout plans for typical installations. For your copy, use Reader Service Card.

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1—5000/2500 Ampere, Columbia, 690 RPM
1—2000/1000 Ampere, H-V-W, 690 RPM
1—1250/625 Ampere, H-V-W, 850 RPM
1—1000/500 Ampere, Chandeysson, 690 RPM
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1—200Ampere, 15 V. Master
1—1000 Ampere, 15 V. Gen. Elec.
1—300 Ampere, 15 V. Star
1—800 Ampere, 22/31 V. Gen. Elec.
3—1500 Ampere, 20 V. Elec. Prods.
1—67 Ampere, 24 V. West.
1—600 Ampere, 24 V. Reliance
1—200 Ampere, 25 V. Star
1—1000 Ampere, 25/35 V. Diehl
1—300 Ampere, 25 V. Star
1—175 Ampere, 25 V. Cr. Wh.
1—500 Ampere, 32 V. Columbia
2—100 Ampere, 30 V. Gen. Elec.
1—200 Ampere, 30 V. West.
2—200 Ampere, 32 V. Gen. Elec.
2—1500 Ampere, 32/40 V. Elec. Prods.
1—1000 Ampere, 33 V. Gen. Elec.
2—200 Ampere, 42 V. Gen. Elec.
3—1500 Ampere, 45 V. Century
1—1500 Ampere, 50 V. Gen. Elec.
2—800 Ampere, 50 V. Gen. Elec.
1—400 Ampere, 50 V. Gen. Elec.
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A. E. S. News

The Milwaukee Convention

June 27 to 30

The following names have been added to the list of Committee chairmen, according to William Geissman, General Chairman.

Exhibits—Gene Bost, 3446 N. 78th Street, Milwaukee 10, Wis.

Plant Visitations—Omer Doyle, 2505 E. Stratford Street, Milwaukee 11, Wis.

The Convention Committee is planning a comprehensive program to *publicize* the many attractions of the Convention, not only to encourage attendance by A. E. S. members but also to focus the attention of industry and the public on the role played by electroplated and allied finishes in the industrial life of the Nation and in the services performed by the A. E. S. in stimulating progress and education of its members. Local newspapers, the trade press, the radio, and direct mail will all be used for this purpose.

The response to requests for *papers* has been gratifying, about a dozen having been offered by December 1. They cover a considerable range of interests among the members and promise to add much to the knowledge and understanding of industrial practices.

Branch Libraries

One of the most efficient ways of wasting money is to repeat the mistakes of the past or try out ideas which have already proved wrong. By the same token, much time, effort, and money is saved by him who knows about the successful methods employed by others.

The purpose of textbooks is to bring together in a concise manner the experience of the past. A textbook, however, cannot go into the fine detail because its size is limited by the cost of production and the price the average reader is willing to pay. Such detail, when required, must be gotten out of the original publication to which reference is made in the book.

It is, therefore, a most useful and praiseworthy task that the Branches undertake when they decide to establish files of back issues of the Society's publications in local libraries. Fifteen Branches have already done so, and have, in addition, shouldered the cost of keeping such files up to date. Other Branches have just begun. It is hoped that their members will do everything in their power to bring this undertaking to a successful conclusion.

It is recognized that especially the younger Branches will need assistance, there being no local members who can contribute older copies. Such copies have to be supplied from the general file established in the Executive Secretary's office. This, of course, must be maintained by assistance of the membership-at-large and with excess copies collected by the Branches.

Many members who have retired from active participation in plating, as well as others, have made it a point to send their files of Society publications to Jenkintown. The Society wishes to commend these men and encourage others to do likewise. It is more than happy to pay the transportation cost.

At this time sincere thanks are due Mr. A. M. Pflomm of Newark, N. J., Nutmeg Chrome Corporation, Hartford, Conn., and Vic Miner Company, Toledo, Ohio for their assistance. The back issues they have sent will be put to good use.

1948 Index

The index of contents of Plating for 1948 will be published in the February issue. It will be a great deal more detailed than former indexes and hence more useful.

This index is being prepared by Mr. K. M. Huston who is also preparing new indexes for previous years. It is planned to issue a Decennial Index covering 1939-1948 in about one year.

Mary Hertzog Perry

Mary Hertzog Perry who recently was appointed Fellow on A.E.S. Research Project No. 2, "Determination of Impurities in Electroplating Solutions" under Dr. E. J. Serfass, was born in Bethlehem, Pa. on October 24, 1922. After receiving her B.A. degree in Chemistry from Russell

Mrs. Perry

Sage College in Troy, N.Y. in 1944, she was an assistant in chemistry at Connecticut College for Women, New London, Conn. The following year she entered Lehigh University's Graduate School and received her M.S. the following June. While attending Lehigh University she met William M. Perry, also a graduate student. They were married March, 1947.

During the year 1947-48, Mrs. Perry was an instructor at Cedar Crest College, Allentown, Pa. She has now returned to Lehigh University where she hopes to finish her Ph.D. program.

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Branch News

COMING EVENTS

CHICAGO BRANCH

ANNUAL EDUCATIONAL SESSION
AND BANQUET
Saturday, January 15
in Stevens Hotel

Educational Session in the Afternoon

Dr. H. J. McDonald, Illinois Institute of Technology, "Corrosion—Enemy of the Plating Industry"

Mr. Myron B. Diggin, Hanson-Van Winkle-Munning Company, "Levelling of Electrodeposits"

Dr. H. L. Kellner, Lea Manufacturing Company, "Evaluation of Polished Surfaces"

Mr. W. M. Phillips, General Motors Research Laboratories, "Deep Sea Diving in a Plating Cell"

Banquet in the Evening

J. M. ANDRUS, *Secretary-Treasurer*

DAYTON BRANCH

FOURTH ANNUAL EDUCATIONAL SESSION
AND DINNER-DANCE
Saturday, February 12
in Miami Hotel

Educational Session at 1:30 P. M.

Honorary Chairman, Mr. S. S. Johnston, Weirton Steel Company, Weirton, W. Va., A. E. S. President

Mr. George W. Jernstedt, Manager, Electroplating Projects, Westinghouse Electric Company, East Pittsburgh, Pa.

Dr. Louis Weisberg, Consultant, New York City, Chairman, A. E. S. Research Committee

Dr. Ralph Schaefer, Director of Research, Cleveland Graphite Bronze Company, Cleveland, Ohio, Vice-Chairman, A.E.S. Research Committee

Dinner-Dance at 6:30 P. M.
Entertainment

CORLISS W. POWELL,
Chairman, Publicity Committee

GRAND RAPIDS BRANCH

ELEVENTH ANNUAL EDUCATIONAL
SESSION AND DINNER-DANCE
Saturday, January 29
in Pantlind Hotel

Educational Session at 2:00 P. M.

Chairman—S. S. Johnston, Weirton Steel Company, A. E. S. President

Mr. Myron B. Diggin, Technical Director, Hanson-Van Winkle-Munning Company, "Levelling of Electrodeposits"

Dr. M. M. Beckwith, Harshaw Chemical Company, Cleveland, Ohio, Subject to be announced

Dr. A. K. Graham, Graham, Crowley & Associates, Inc., A. E. S. Executive Secretary, "What Constitutes a Satisfactory Electrodeposit"

Dinner at 7:00 P. M.
Floor Show
Dancing from 10:00 P. M.

Reservations: Jack Hanney, 1105 Dickinson Street, S. E., Grand Rapids 7, Mich., Telephone 5-4310

BALTIMORE-WASHINGTON BRANCH

Twenty-six attended the regular monthly meeting on November 9 at the National Bureau of Standards.

MR. C. R. FISCHRUPP of the Hawthorne Works of the Western Electric Company gave a very interesting talk on "Current Industrial Methods of Plating Zinc, Nickel and Chromium, Using Automatic Equipment". Illustrating his talk with slides and exhibits, Mr. Fischrupp gave a very clear and informative discussion of the plating equipment and procedures used at Hawthorne, including the advantages of automatic equipment, storage of plating baths, periodical cleaning of plating tanks, reuse of rinse water, and use of mixing tanks and heat exchangers. An interesting method of inspection and sampling was described. Barrel plating equipment, sources of current, magnetic racking, and laboratory equipment were also described along with the plating conditions and cycles for zinc, nickel, and chromium.

The audience was obviously pleased with the talk and gave Mr. Fischrupp a big hand.

FIELDING OGBURN, *Secretary*

BOSTON BRANCH

On October 7 the officers and Board of Managers met at 7:45 P. M. in a business session together with those members interested in the operation of the Branch. After PRESIDENT GAGNON had instructed the officers in the duties of their position and some routine business had been taken care of, MR. GLOVER reported that plans for the Annual Meeting on Saturday, April 16 and for the 1950 Convention and International Conference were progressing along predetermined lines. The Secretary, DR. SWIFT, then reported on the business meeting at Atlantic City, and Mr. Glover on the election of ANDREW W. GARRETT to Honorary Membership in the A. E. S.

At 8:30 P. M. the meeting was turned over to Librarian Glover, who introduced MR. BERT SAGE of Trubrite Chemical Products, Oakville, Conn., a former member of the Branch. During his talk on "Brass Plating" he distributed samples of brass plated steel tacks and clips which had been plated under various conditions. The following subjects were covered in some detail: ordinary plating methods, carbonate content and removal, metal content and copper-zinc ratios, temperature and pH relationship, current density, alkali and bicarbonate additions, filtration, color and chemical control, treatment of stock prior to plating, bright brass barrel plating, burnishing after plating, types of anodes, antique finishes, drying methods, and equipment. A lengthy question and answer period brought the meeting to a close.

GEORGE P. SWIFT, *Secretary*

BRIDGEPORT BRANCH

The regular monthly meeting on October 1 had an attendance of thirty-five members and guests. Four applicants were elected to membership, one new membership application was received, and two members were suspended for nonpayment of dues.

It was decided to purchase a screen for use with the Branch's film and sound projector.

PRESIDENT C. L. TEMPLE requested C. C. HELMLE to take over the question box in the absence of A. R. MCNEIL.

Q. 1. Can 0.005 inch or more chromium be deposited on 0.0003 inch nickel plate without the chromium or nickel lifting? Does it make any difference whether the base metal is brass or steel?—*A.* If the base metal, whether brass or steel, has been properly cleaned, the chromium plate will not lift the nickel or chromium.

Q. 2. What effect does elevated temperatures have on the plating out of contaminants in zinc and cadmium baths?—*A.* Do not increase the temperature, but plate out at very low current density (low voltage).

Q. 3. What influences the throwing power of chromium plating solutions and what is the easiest way to increase it in a decorative cycle? What is the ideal chromic acid-sulfuric acid ratio?—*A.* Several ratios were suggested, from 90:1 to 120:1. The parts should be racked properly and the surface prepared for chromium by the use of a dip in sulfuric or hydrochloric acid or in a 10 per cent sulfuric acid containing 0.1 oz/gal potassium iodide.

Q. 4. Which is the best cold solution for deposition of a 0.030 inch thick stress-free nickel plate? The questioner uses a bath containing 48 oz/gal nickel sulfate, 5 oz/gal nickel chloride, 4.5 oz/gal boric acid and a wetting agent at *p*H 5.0 and 100° F, but finds 15-hour plating time too long and the plate too highly stressed.—*A.* Contact some of the large companies dealing with this type of problem of fast nickel plating.

Following adjournment, refreshments were served by courtesy of RAY W. GOBAL of Enthone, Inc., New Haven, Conn.

JOSEPH G. STERLING,
Secretary-Treasurer

BRIDGEPORT BRANCH

Twenty-two members and guests attended the dinner and sixty the Open Meeting and Educational Session on October 15.

Technical Chairman A. R. McNeil first called upon Mr. Hubert M. Goldman, who presented a paper on "Speculum Plating" from the Tin Research Institute. He then introduced Mr. Adolph Bregman, Secretary of the Masters' Electroplating Association, New York, whose subject was "Job Shop Practice and Policy". Following a review of the many standard and special finishes which the plater has to offer, the speaker outlined essential requirements for success: (1) Do a good job which satisfies both the customer and the public at large. (2) Do it at a price that is fair both to the plater and to the customer. (3) Keep your promises to the customer. (4) Give sound advice on finishes for the customer's products. (5) Know how to figure costs and overhead (read Ray J. O'Connor's paper on "Sound Cost Control Procedures in the Job Plating Business" published in the February, 1947 issue of The Monthly Review). Mr. Bregman's interesting paper provoked considerable discussion.

Joseph G. Sterling,
Secretary-Treasurer

CHICAGO BRANCH

The speaker on November 12 was Mr. E. G. Kominek of Infilco, Inc., Chicago, who presented a very thorough paper on a vital subject, "Plating Room Wastes". While the plating industry in the Chicago area may be fortunate in not being forced to install waste disposal units at the present time, it was most worthwhile to receive the required information.

Four new members were elected at this meeting, attended by 125.

Arthur G. Bartmann,
Correspondent

CLEVELAND BRANCH

At the November 5 meeting Mr. Raymond F. Ledford of Chicago, Service Engineer for the Hanson-Van Winkle-Munning Company, spoke on "Hot Dip Galvanizing Pre-Treatment and Good Operating Techniques That Lead to Low Costs". Mr. Ledford described cleaning and fluxing operations prior to dipping work into the zinc pots. Photomicrographs were used to illustrate the increase in brittleness with increase of thickness of the zinc-iron alloy layer beneath the zinc coating. Optimum immersion time for different types of work to prevent excessive alloy-layer thickness were discussed.

One new member was received by election and another by in-transfer from the Newark Branch.

Harry Pochapsky,
Secretary-Treasurer

DAYTON BRANCH

Mr. Fred Bauch, of the Frigidaire Division of General Motors Corporation and a member of the Branch, spoke about "Alkaline Tinplating" at the regular meeting on November 5.

The speaker started with early history, describing the various stages of development up to the present time. It is interesting to know that two oldtime members of this Branch, Walter Fraine and Dick Meader, pioneered the development of the first large scale commercial sodium stannate bath. He then analyzed the advantages and disadvantages of the sodium and potassium stannate baths, illustrating his points with slides of a number of graphs. The use of potassium bath increases the allowable current densities to 1000 asf with relatively high cathode efficiencies, a feature that is especially valuable in the plating of strip steel. In general, the field of application of each bath is dictated by economic considerations. A lively discussion followed, after which refreshments were served.

A film and a talk on "High Speed Photography" by Ernest Johnson of the National Cash Register Company has been arranged by Bill Cryderman for the meeting of January 7.

Fred Bauch, *Secretary*

DETROIT BRANCH

Activities for the 1948 season were resumed on September 10, when an audience of one hundred and fifty members and guests heard Mr. Leland S. Morse of the Material Testing Laboratories of the Chrysler Corporation present a most informative paper entitled "What Is Quality in Plated Ware?" His well-planned paper had a wide scope and contained a charge to the plating industry to get "its house in order". The discussion period that followed was full of many well-directed and capably answered questions.

The Membership Chairman, Ed Hahn, appointed a large committee with the avowed intention of once again making Detroit the largest Branch. Six new members were nominated.

F. J. Newton, *Librarian*

DETROIT BRANCH

The regular meeting of the Detroit Branch was held on October 1 in the Hotel Statler. An attendance of one hundred and seventy-five members and guests were present to hear our speaker. One new member was elected, but better performance was promised by the Membership Committee.

Following a showing of pictures of the A-bomb tests, Mr. Frank K. Savage presented a very fine paper on "Electroforming and the Lessons the Electroplater Can Learn from Its Counterpart". Every electroplater present was given "food" for thought and also information of sufficiently practical nature that it could be put to use. A question-and-answer period kept Mr. Savage busy for nearly a half hour.

F. J. Newton, *Librarian*

DETROIT BRANCH

A group of one hundred and fifty members and guests braved a wet and stormy evening to attend the regular meeting on November 5, at which fourteen new members were elected to membership.

After viewing a beautiful color movie on trout fishing in the Canadian Rockies, an excellent paper was presented by Mr. Joseph Kushner, Metal Finishing Engineer of Stroudsburg, Pa. His paper, entitled "Fluid Mechanics—the Forgotten Factor in Electroplating", was very comprehensive and replete with ideas as yet unexplored in the field of electroplating. Many of Mr. Kushner's points were of great importance and capable of being transferred into action; some require a great deal of further research. A lively discussion period followed the paper.

F. J. Newton, *Librarian*

GRAND RAPIDS BRANCH

Approximately forty members and guests were present at the third meeting of the 1948–1949 season, held in the English Room of the Rowe Hotel on November 12. Five new members were elected, and three applications for membership were received.

Plans were discussed for the Annual Dinner-Dance on January 29 in the Pantlind Hotel. Arrangements for the Educational Session in the afternoon are quite complete and several excellent speakers are scheduled to appear.

The guest speaker for the evening was Dr. H. Brown of The Udylite Corporation, Detroit, who gave a highly informative talk on "Induced and Inherent Porosity of Electrodeposits". Dr. Brown proved to be an excellent speaker and his subject was of great interest to everyone present.

Following adjournment, a buffet luncheon was served by the hotel.

Jacob M. Hage, *Secretary*

JACKSON-LANSING BRANCH

The meeting on October 12 was held at Hotel Hayes, Jackson, Mich., with sixty-five members present. Messrs. Evans S. Schmeling and Lowell McCoy of The Wyandotte Chemicals Corporation presented very interesting discourses on "Metal Cleaners" and "Barrel Finishing", respectively.

On November 9, in Hotel Porter, Lansing, sixty members attended a dinner-meeting sponsored by the Hanson-Van Winkle-Munning Company whose genial Barney Case presented an enlightening round-table discussion of nickel plating problems. As his "board of experts", he had Mr. Uhlo Forsyth of the Oldsmobile Division of General Motors Corpora-

tion and Dr. D. T. Ewing, Chemistry Department of the Michigan State College. As customary, the meeting closed with movies of Michigan wild life.

L. M. Henderson,
First Vice-President

LANCASTER BRANCH

Thirty-two members and guests attended the regular monthly meeting on November 12. Four applications for membership were received and seven new members elected.

Librarian Hain introduced Mr. Edward C. Rinker of Bart-Messing Corporation who spoke most interestingly on the "Plating of Precious Metals". He emphasized gold in his lecture, for, as he said, very little is written on this subject. Following the presentation of a series of proven bath formulas and a discourse on the alloy or Karat baths, Mr. Rinker demonstrated a gold plating barrel and displayed samples. These samples were well received, because they demonstrated the possibilities of PR plating as well as the microscopic quantities of gold required to cover and color an article.

C. W. Smith, *Secretary-Treasurer*

MELBOURNE BRANCH

The 37th Regular Meeting was held in the Victorian Chamber of Manufactures on September 27 with thirty-five members and visitors present.

After a short business session Librarian H. Teague introduced the two speakers for the evening. Mr. H. K. Littauer spoke on "The Dyeing of Anodized Aluminum" and was followed by Mr. C. E. Naylor who discussed "The Coloration of Stainless Steels". Both speakers illustrated their talks by handing specimens to the audience and were kept busy answering questions for a considerable time.

John J. Dale, *Honorary Secretary*

MELBOURNE BRANCH

The 38th Regular Meeting was held on the 25th of October at 8:00 P. M. in the Chamber of Manufactures, Melbourne. In the unavoidable absence of the President, the chair was occupied by Vice-President N. L. Carter, who welcomed two new members.

Twenty-five members and six visitors were present to hear a most able address by Mr. J. J. Dale on the subject of "Porous Chromium". The speaker discussed the use of these deposits for cylinder bores and piston rings, and described Australian investigations on the structure of chromium deposits as it affects surface porosity and on the performance of porous chromium plated items.

N. L. Carter, *First Vice-President*

MONTREAL BRANCH

The regular monthly meeting of the Montreal Branch was held on November 2 in the Mount Royal Hotel with twenty-two members and guests present. Two new members were elected. Banquet showed a net profit of $31.81.

Through the courtesy of the Aluminum Company of Canada and R. C. A. Victor Corporation the film "Dateline Tomorrow" was shown. Much interest was displayed by the members, and Mr. J. R. Charlton of the Aluminum Company answered all questions raised by the film. It was suggested by J. H. Feeley that a party be organized to visit the Aluminum Laboratories in Kingston.

J. D. Fairbarn reported with much regret that R. E. Gordon was in ill health and unable to attend meetings regularly.

B. Mendels, *Secretary*

NEWARK BRANCH

Forty members and guests attended the meeting on November 5 at which one applicant was elected and two men applied for membership while not less than eighteen members were suspended for non-payment of dues.

Librarian Edwin Bowerman introduced Mr. E. M. McCool, Sales Engineer for the Safety Mine Appliance Company, who spoke on the subject of "Health and Safety Hazards in Plating". To supplement his talk the speaker showed three reels of movie film on the construction, testing, and applications of respirators. Hazards are encountered in the cleaning, the plating, the polishing and finishing, and lacquering. Chemicals that destroy health, if present for any length of time even in small concentrations, were said to be cyanides, arsine, nitrogen dioxide, chlorinated solvents used in degreasing machines, and chromic acid. Polishing dust can also contribute to respiratory diseases, as well as fumes from pickling and plating solutions. His paper was well received and many questions were asked such as: "Why is dirty trichlorethylene more toxic than fresh solvents"? "Why are sodium fumes dangerous in minute quantities"? "Is potassium cyanide more dangerous than sodium cyanide"?

The Question Box contained four questions, namely, "What causes silver plate on soldered brass to turn pink on aging"? "Does polishing beryllium alloys involve any special health hazard"? "How is an olive-drab coating applied on nickel plated brass"? "How is copper plating done successfully on stainless steel so that the part will stand brazing after plating"? Some answers were proposed, but more information is needed to bring them to sound practical conclusions.

S. S. Frey, *Recording Secretary*

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NEWARK BRANCH

The meeting on November 19 had an attendance of seventy members and guests. Two new members were elected and two suspended members reinstated. There were also two new applications for membership.

Librarian Edwin Bowerman introduced Messrs. L. Cates and L. McKenner of Enequist Chemical Company, who gave a lecture demonstration of how bright brass may be plated on buffed steel, nickel, zinc base die castings, etc. Everyone appeared to enjoy the wit and humor that was displayed by the speakers, and credit goes to Mr. Kenner for his ability to convince his audience that he could do what he claimed. The brass deposits had a golden color but were not of the usual zinc-copper ratios associated with conventional brass.

The proprietary plating solution had a free cyanide content of 3½ oz/gal and was operated around 100° F at a cathode current density between 20 and 100 asf. No agitation was required, in fact, better color control could be maintained without it. Copper anodes were used, but some or all of the copper anodes may be replaced with carbon anodes.

So interesting was the demonstration and the question period which followed, that the meeting was never adjourned officially.

Samuel S. Frey, *Recording Secretary*

NEW YORK BRANCH

One new application for membership was received at the meeting on November 12.

The business session was abbreviated to provide more time for the evening's speaker, Mr. William Schneider, of E. I. du Pont de Nemours & Company, who delivered a talk on the timely subject, "Bright Zinc Plating". Following a comparison between zinc and cadmium, which showed that despite the higher cost of cadmium metal, the quality of plate and ease of plating made it quite popular in comparison to zinc plate until the availability of cadmium entered the picture, the speaker exhibited samples of his company's bright zinc. They supplied a strong argument in favor of zinc as a substitute for cadmium when the proper passivating dips and recommended plating cycle are used.

A lively session of questions ended the meeting.

Albert Fusco, *Recording Secretary*

NEW YORK BRANCH

Seventy-five members and two guests from England, Messrs. Bristol and Alcon, were present at the meeting on November 26 at which one application for membership was received.

President Milton Nadel, the speaker of the evening, discussed his practical experience with the plating of zinc base die castings and reviewed the methods of past and present. The condition of the raw casting, its polishing, its cleaning and method of plating, each has a most important and interrelated effect upon the quality of finished plate. Some of the effects of deviation from proper conditions were noted.

The application of periodic-reverse brass plating of the castings prior to nickel plating was favored because of the resultant quality of finish. Formulae of solutions used were presented. The need for additional work was stressed.

Albert Fusco, *Recording Secretary*

PITTSBURGH BRANCH

Dr. E. J. Serfass of Lehigh University, Project Director of A. E. S. Research Project No. 2, gave a very interesting and instructive lecture on the methods developed for "Determination of the Metallic Impurities in Electroplating Baths", at the meeting on November 11.

Following the educational session, Mr. R. Hummel of Harshaw Chemical Company showed Kodachrome slides taken while on a fishing trip in Northern Canada.

Glade B. Bowman,
Secretary-Treasurer

PROVIDENCE-ATTLEBORO BRANCH

Mr. Edwin Rinker of Bart-Messing Corporation, Brooklyn, N. Y., discussed "Precious Metal Plating" at the November 15 meeting.

For deposition of heavy coatings (0.2–0.5 mil) Mr. Rinker suggested a solution contsining 20 grams gold and 25 grams free potassium cyanide per gallon with insoluble anodes at 5 asf, 160° F, and cathode agitation. On an experimental scale a PR cycle of 5 to 1, although increasing the time required by 50 per cent, markedly improved the brightness, decreased the variation in thickness, and reduced the grain size.

For barrel plating the speaker advocated pulsating DC current. His formula was 8 grams gold and 25 grams potassium cyanide per gallon. Considerable discussion developed regarding the speaker's theories on barrel alloy plating.

Attendance was fifty-five.

Edward A. Parker, *Secretary*

ROCHESTER BRANCH

The regular monthly meeting on November 19 was called to order by Vice-President Joseph Hull in the absence President Flint. Thirty-five members were present. One new member was received.

Dr. Walter R. Meyer, President of Enthone, Inc., New Haven, Conn., spoke on "Acid Treatments of Metals, including Bright Dipping, Pickling, and Electropolishing". Numerous questions were asked of and answered by Dr. Meyer. The scientific explanations of the common effects of bright dipping were most educational.

James Weaver, *Secretary*

SAGINAW VALLEY BRANCH

Fifty-two members and guests attended the second meeting of the season, on October 13, at which two applications for membership were approved.

The speaker for the evening was Mr. Edward Schroeder of the Electric Products Company, who presented a very interesting talk on generators. The theme, "Profit Dollars" through proper utilization of generators, was illustrated by what can be realized not only through the increased efficiency but also through power factor correction. Mr. Schroeder concluded his talk with slides showing the constuction of a modern motor-generator set.

The meeting was brought to a close with a technicolor film of the 1948 Soap Box Derby.

L. J. Minnigle, Jr., *Secretary*

ST. JOSEPH VALLEY BRANCH

Twenty-two members and their guests attended the regular November dinner meeting at Hotel Elkhart, on the third of the month. One new member was elected, and two applications received.

President James Hedges appointed William McDowell a member of the Board of Managers to succeed Leonard E. Weeg, whose membership was transferred to Rockford Branch last summer. First Vice-President Raymond Friend chose E. J. Wilhelm and Ralph D. Wysong for the Research Committee. Second Vice-President Dr. Harold Wiesner appointed the following members to his two committees: Louis Raque, Calvin G. Smith, and Proctor Moore to the Membership Committee, and Kenneth Harlan and William McDowell to the Entertainment Committee.

The speaker of the evening, Mr. Frank Savage, Past President of A. E. S., spoke on "Plating Racks". His talk was very interesting and greatly enjoyed by the small group in attendance, as was proven by the number of questions asked during the evening.

V. E. Peterson, *Secretary-Treasurer*

ST. LOUIS BRANCH

The first meeting of the new season was held on October 13, with sixty members present for dinner.

The new officers, who took over the reins of the branch, are President, George Nagel; Vice-President, John Vogt; Librarian, L. A. Davies; Secretary-Treasurer, Ed Hunleth. New Board members are Albert Barth, H. E. Sibnall, and Fred Stark. Henry Siegel was appointed Chairman of the Research Committee.

Librarian Davies, after discussing the advantages of a Question Box and the program for the year, introduced Messrs. W. M. Phillips and F. L. Clifton of General Motors Research Laboratories, who with the aid of a projector conducted an educational session which will long remain in the minds of our members.

After the meeting all were treated to an evening of extraordinary entertainment.

Edward R. Hunleth, *Secretary*

ST. LOUIS BRANCH

The featured speaker at the November meeting was Mr. K. Ruhly, who gave a very interesting talk about "Rack Coatings". He followed Librarian L. A. Davies, who conducted a Question Box.

Eugene F. Conroy, Jr., was elected President to succeed George Nagel, who has moved to Texas. To get delinquent members to pay their dues S. A. Robins suggested that he and some other members be given lists of names to call on. A special committee to assist with dues collection will be appointed in February.

Edward R. Hunleth, *Secretary*

SPRINGFIELD BRANCH

The meeting on October 25, with a good percentage of the membership present, instructed Librarian John Horrigan to obtain speakers to discuss, during the coming year, copper, nickel, zinc, and chromium plating, filtration, and plating room ventilation. All present were anxious to do their share in making the Regional Meeting, which is expected to be held in Springfield in the Spring, a real success.

The meeting was then opened to a general discussion of plating questions and problems. Ernie Couture began by explaining some of the troubles he had in preparing steel prior to bright nickel plating, especially in a full automatic installation, and how they had been solved by the use of an emulsion cleaner. This led to a discussion of alkaline electrocleaners as compared to emulsion cleaners; the consensus seemed to be that best results are obtained when one is used in conjunction with the other. John Horrigan brought out the effects of emulsion cleaners on rack coatings; all seemed to agree that the newer rack coatings stand up very well. Carl Butler asked if anyone had had any experience with emulsion cleaners to remove buffing compound from etchings which also contained enamel. Larry Fountain believed that by varying the composition of either the buffing compound, the emulsion, or the enamel, a workable cleaning cycle could be found. Ernie Couture concluded by saying that his best cleaning cycle for removing fingerprints and slight oil film was emulsion cleaner spray, cold water spray, hot water rinse, reverse alkaline cleaner, and two rinses.

The members all seemed to enjoy this modified round table discussion, joining in the proceeding more than they normally do when a guest speaker is present.

Harold Oehler, *Secretary*

SPRINGFIELD BRANCH

The meeting on November 22 was by far the most enthusiastically attended meeting of the current year with better than two-thirds of the membership present. Evidently the members approve of the program of meetings that have been laid out for the coming year.

November was copper month and the Branch was exceedingly fortunate to have Mr. Floyd Oplinger of the E. I. du Pont de Nemours & Company accept the Librarian's invitation. Mr. Oplinger began his talk on copper plating by reviewing briefly its history from its beginning almost a century ago. It was very interesting to note that rapid progress was only made during the past twenty-five years when the first so-called high-speed copper baths were introduced. A brief description of addition agents for copper solutions followed with a warning as to their limitations. The speaker also mentioned the recent increased use of acid copper solutions because of the brighter deposits obtained on certain types of work. The composition of copper solutions was outlined, with special emphasis on the importance of concentration, temperature and agitation. Generalizing the latter part of his talk, Mr. Oplinger covered such points as tanks and equipment, solution impurities, filtration, diaphragm liners, periodic-reverse current, and barrel plating. The meeting was then opened to a question period in which the members joined wholeheartedly. Brighteners and periodic reverse current seemed to have created the most interest.

Ralph McCann, who came along with the speaker, was warmly greeted by many of his old friends in Springfield. Norman Plank, Chester Klimek and a good-sized delegation from General Electric in Pittsfield braved a wet stormy night for the long drive.

A new member was accepted by the Branch.

Harold Oehler, *Secretary*

TWIN CITY BRANCH

On October 4, Dr. Frank Ireland of Brown and Bigelow opened a series of lectures on metal finishing with a discussion of principles of chemistry, electricity and electrochemistry. The thirty people in attendance seemed well pleased with the project.

It was announced that each member would be invoiced an additional two dollars, the increase in annual dues voted at the last Convention.

The monthly dinner prize was won by Al Leonard of Superior Plating, and the silver goblet, donated by Al Joyner of the Silver Shop, by Reuben Ostrom.

After a brief business meeting, Mr. Paul Felt, Vice-President of Brown and Bigelow and one of our members, who recently returned from a trip to Europe, including the Scandinavian countries, described his trip and showed excellent movies.

Robert L. Buckley, *Secretary-Treasurer*

TWIN CITY BRANCH

The Twin City Branch met on November 1 with thirty-five persons present.

The monthly plating lecture on "Copper Plating" was presented before the dinner. The lecture was given by Mr. Robert Buckley of Industrial Chemical and Equipment Company. It was followed by a round-table discussion on the same subject led by Jerry Weller of Brown and Bigelow. The turnout for the lecture was good.

The door prizes, a billfold and a free dinner, were won by Al Joyner, Sr. and Ralph Bowman of the Silver Shop and Superior Plating, respectively. E. R. Frost of E. R. Frost Company and Peter Ruehle of Ruehle Plating Company were welcomed back following their recent illness. One new member was also welcomed.

The speakers for the meeting were Messrs. C. R. Johnson and Earl Gothier of Minnesota Mining and Manufacturing Company, who spoke on "Abrasive Belt Finishing in the Metal Finishing Industry". The talk was very good and greatly appreciated by those present.

Robert L. Buckley, *Secretary-Treasurer*

WESTERN ONTARIO BRANCH

The following were elected officers at the initial meeting of the Branch in October:

President—Harvey Curry, Windsor

First Vice-President — W. Brodie, Chatham

Second Vice-President—Ed Heller, Sarnia

Secretary-Treasurer—D. Paton, Wallaceburg

Librarian—Ed Turner, Chatham

Norman Southern of Wallaceburg, Norman Matt of Windsor, Paul Croly of Chatham, Art Campbell of Sarnia, and Bob Rawlings of Watford were elected to the Membership Committee.

The speaker for the evening was Dr. R. B. Saltonstall of The Udylite Corporation. His topic was "Maintenance in the Plating Room". The very informative talk led to a great deal of discussion by the members.

Douglas E. Paton, *Secretary-Treasurer*

Membership Report of the A. E. S.

Elections

ADELAIDE BRANCH: M. K. Birrell

BALTIMORE - WASHINGTON BRANCH: Bruce Darling

BRIDGEPORT BRANCH: Robert W. Reid.

BUFFALO BRANCH: T. Joseph Cuerdon, Jr., Gordon H. Fisk, Frank W. Rudolph, S. J. Soplop

CHICAGO BRANCH: Wilbert L. Berberick, Donald K. Olson, Norman C. Wagner, Ralph V. Zullo

CLEVELAND BRANCH: Edward J. Patt

GRAND RAPIDS BRANCH: Anton T. Draft, Ira E. Hansel

INDIANAPOLIS BRANCH: William L. Baughn, Carl C. Hardebeck, B. R. Haueisen, William S. Penk

JACKSON-LANSING BRANCH: Clarence A. De Groat, Robert T. Rollis, Robert A. Stewart

LANCASTER BRANCH: Charles F. Bream, Charles H. Cline, Lloyd M. Schaeffer, Irvin P. Sharretts, Bruce E. Snyder, J. Luther Snyder, Meade B. Wilt

MELBOURNE BRANCH: D. H. Packhurst, K. G. Whiting

NEW HAVEN BRANCH: Austin P. Jackson, Achille Labanara, Gabriel Macare

NEW YORK BRANCH: Hans Berman, Felix Friedman

PHILADELPHIA BRANCH: Mary T. Kunkel

PITTSBURGH BRANCH: Wilfred N. Barbian, George Bartle, Andrew Benko, 3rd, Charles W. Churchill, Jack A. Fletcher, David H. Haltman, Albert A. Klein, John W. Lee

ST. LOUIS BRANCH: Louis Barkley, A. S. Burnett, Stanley Johns, George Nagel, Emmett A. Sommerlad, Eugene L. Sommers

SAGINAW VALLEY BRANCH: Richard P. Blake, Eldon A. Brisson

SYRACUSE BRANCH: William P. Clemons, R. N. Hitchcock, Willard F. Moore

SYDNEY BRANCH: F. N. Kulmar

TOLEDO BRANCH: Gayle R. Goldsworthy, Jack U. Goldsworthy, Jack C. Morrow

WATERBURY BRANCH: George Czar

MEMBERSHIP-AT-LARGE: Max L. Alkan, Oliverio Laperal, Harold Taylor

Reinstatements

BALTIMORE - WASHINGTON

MEMBERSHIP CHART

	Membership May 1, 1948*	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
TORONTO	143	9	+ 9½	+ 6 6
CLEVELAND	190	14	+12	+ 6 3
DETROIT	407	15	+11½	+ 2 8
BOSTON	163	3	+ 3	+ 1 8
BRIDGEPORT	154	11	− 1	− 0 6
GRAND RAPIDS	148	2	− 1½	− 1 0
LOS ANGELES	234	1	− 4	− 1 7
NEW YORK	270	11	− 5½	− 2 0
PHILADELPHIA	205	8	− 7	− 3 4
NEWARK	280	7	−20	− 7 1
WATERBURY	128	4	−10½	− 8 2
PITTSBURGH	149	9	−13	− 8 7
HARTFORD	150	5	−21	−14 0
CHICAGO	445	17	−74	−16 6
SECOND GROUP				
SYDNEY	91	24	+18	+19 8
NEW HAVEN	110	8	+ 8	+ 7 3
INDIANAPOLIS	103	6	+ 5	+ 4 9
ST. LOUIS	103	6	+ 4½	+ 4 4
MILWAUKEE	124	6	+ 3	+ 2 4
DAYTON	90	7	+ 1	+ 1 1
SAN FRANCISCO	77			
CINCINNATI	80		− ½	− 0 6
BALTIMORE-WASH.	96	4	− 2½	− 2 6
TWIN CITY	77	2	− 5	− 6 5
PROV.-ATTLEBORO	117	6	− 8½	− 7 3
ROCHESTER	120	3	− 9½	− 7 9
ST. JOSEPH VALLEY	98	3	−11½	−11 7
BUFFALO	94	9	−13½	−14 4
THIRD GROUP				
SAGINAW VALLEY	38	9	+16	+42 1
MELBOURNE	68	14	+14	+20 6
LANCASTER	46	9	+ 8	+17 4
ADELAIDE	65	15	+11	+16 9
LOUISVILLE	18	3	+ 2	+11 1
JACKSON-LANSING	64	9	+ 5½	+ 8 6
SYRACUSE	66	11	+ 2½	+ 3 8
MONTREAL	63	3	+ 1½	+ 2 4
COLUMBUS	38	7	+ ½	+ 1 3
ROCKFORD	59			
TOLEDO	73	3	− 1	− 1 4
SPRINGFIELD	56	1	− 3	− 5 4
SOUTHEASTERN	49	2	−15	−30 6
OTHERS	114	32†	+29½	+25 8
TOTAL A. E. S.	5,263	319	−56	− 1 1
Active Membership, December 5, 1948			5,207	

*Subject to correction.

†Including 21 in Allentown-Reading Branch.

BRANCH: H. J. Lebherz, Jr.
ST. LOUIS BRANCH: D. Bolward, Eric Epple

Transfers

Ralph Mead to Buffalo Branch; R. E. Campbell to Buffalo Branch; Lawrence Hay to Chicago Branch; Robert C. Axson from Detroit Branch; C. A. Heavens from Detroit Branch; William F. Castell from Indianapolis Branch; Oscar Binder from New York Branch to Providence-Attleboro Branch; George Haas from New York Branch; Robert A. Brown to Rochester Branch; Vernon Schaeffer to Rochester Branch; R. M. Garrison from St. Louis Branch

Resignations

BALTIMORE - WASHINGTON BRANCH: Correction: Grace Riddell reported as a suspension should be resignation
BUFFALO BRANCH: Virginia Ratajack
DETROIT BRANCH: M. A. Fellows
LOS ANGELES BRANCH: Harold E. Meyer.
MONTREAL BRANCH: G. Mackintosh, A. S. Mitchell
ROCHESTER BRANCH: Charles P. Wake
SYDNEY BRANCH: W. W. Paterson, Sr.

Suspensions

BRIDGEPORT BRANCH: Edward W. Leverett, Charles B. Percival
BUFFALO BRANCH: H. L. Anderson, Z. Cummings, P. J. Conn, E. Dudkowski, E. W. Erickson, J. D. Gibby, R. G. Gipp, J. R. Kilroy, E. Kopinski, D. Kilmurray, J. Kushner, K. Mau, J. C. Logan, J. Rooney, R. K. Shumway, R. H. Sheldon, H. L. Schroeder, R. B. Thompson, W. Wollage, S. Szoka
NEWARK BRANCH: Boris Borghesi, John Bricker, Harold Buckingham, L. Busch, Kenneth Curry, David G. Fallon, Michael Fetchik, Oliver Gautreau, George Jellinek, Irwin Kempton, Harold Kohlheim, Alfons Latawiec Joseph Mickiewiecz, Robert Pecoraro, Nick Piegaro, Arthur Pinard, Jr., Fred Rosamilia, Walter Zitniak
PROVIDENCE - ATTLEBORO BRANCH: Byron H. Abedon, Preston Armstrong, William V. Biggos, Delbert F. Gifford, Charles E. Goyette, John Gileserian, Harry Holt, Kempton S. Howland, Louis Schriever, Rocco Velletri
ST. LOUIS BRANCH: John Davis, W. A. Hartman, N. E. Robinson
SPRINGFIELD BRANCH: P. P. Ezekiel
SYDNEY BRANCH: K. Charles, A. L. Peach, H. H. Santelben, V. Smithers, C. Waldon, H. L. Wallace
SYRACUSE BRANCH: Burt Donaldson
TWIN CITY BRANCH: H. E. Dimick, Ray Lulling, A. N. McNeil, J. S. Nemer, C. R. Sundquist, Louis Zwick
MEMBERSHIP-AT-LARGE: Frank L. James, E. J. Wright

Deaths

CLEVELAND BRANCH: Fred Matts
SAGINAW VALLEY BRANCH: Rudolph E. Beuthin
TOLEDO BRANCH: Hugh Benner
WATERBURY BRANCH: Edwin A. Maker

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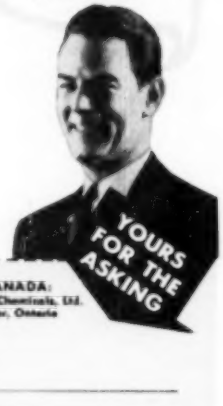

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P-169

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If those who do not plan to keep their copies would send them to P. O. Box 168, Jenkintown, Pa., their assistance will be very much appreciated.

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Executive Secretary . . . . . A. K. GRAHAM
P. O. Box 168, Jenkintown, Pa.

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Chairman . . . . DR. LOUIS WEISBERG
71 W. 45th Street, New York 19, N. Y.

Secretary . . . . . The Executive Secretary

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ADELAIDE, AUSTRALIA. Secretary, C. J. Cocks, 37 Myal Avenue, Kensington Gardens, S. A., Australia.

ALLENTOWN-READING meets third Thursday of each month. Secretary, H. E. Fennell, Box 628, R. D. 2, Reading, Pa.

BALTIMORE-WASHINGTON meets second Tuesday of October, December, February, and April in Baltimore, and of November, January, March and May at the National Bureau of Standards, Washington, D. C. Secretary, Fielding Ogburn, 9607 Riley Place, Silver Spring, Md.

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"Methods for Testing Thickness of Electrodeposits" by H. J. Read and J. H. Thompson. A. E. S. Research Report Ser. No. 11. Price 50c.

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Incentive Plan

(Continued from page 57)

The men police each other. Carelessness, indifference, loafing on the job, lack of cooperation, and disregard for the welfare of fellow workers bring a complaint and a hurried request to get rid of any new help that does not measure up to their standards.

If for some reason men must be assigned to some task outside of their regular plating room duties, they remain in the group and the group receives credit for standard production for the workman while away. This promotes a desire on the part of all concerned that the individual get the job done and get back where bonuses can be earned.

When the plan was put into effect, the employees were furnished a set of rules which clearly outlined the duties of the group as well as specified the tasks outside of the regular duties for which extra credit would be given. The method of arriving at unit credits for new work was explained. Only on a very few occasions have questions arisen; in each case the clear rules have furnished the answer.

The number of units turned in daily by the individuals are carefully checked and charged to the jobs. The office knows how many units each job should earn, and uses the utmost care to see to it that the men receive full credit for all work performed.

We perhaps more frequently call to their attention mistakes made by them in the Company's favor rather than in their own. This leads to confidence in the Company and in the plan and promotes harmony and satisfaction. We have noted that if men must be away on work because of outside business they usually try to pick a time when work is a little slack and their absence will not interfere with production and their unit earnings any more than necessary. They don't jump any more when the boss walks through the shop; they know their story will be accurately told on their time sheet at the end of the day. They find no point in stringing out a seven-hour day to eight hours when work is slack because they can earn as much in seven hours as they can by working slower and getting out the same production in eight hours.

Conclusions

Summing up, we have definitely come to these conclusions:

1. The plan is flexible enough to take care of any situation.
2. The Company is in business to sell production units.
3. The employees have the desire to produce them.
4. In periods where employee bonus earnings have been high, Company net earnings have likewise been high.

Our employees and Company are both well satisfied after three years of living with this incentive plan.

For a general discussion of wage incentives, see F. K. Savage's article in the March, 1948 issue.

Index to Advertisers

ABBOTT BALL COMPANY, THE 75
Agency: R. H. Young and Associates
ACME EQUIPMENT COMPANY, INC. 77
Agency: Ross Llewellyn, Inc.
ALLIED RESEARCH PRODUCTS, INC. 91
Agency: Emery Advertising Corp.
AMERICAN CHEMICAL PAINT COMPANY 16
Agency: May Advertising Company
AMERICAN ELECTROPLATERS' SOCIETY, THE 24

BAKER, M. E., COMPANY 70
BELKE MANUFACTURING COMPANY 9
Agency: Allbright Associates
BLAKESLEE, G. S., & COMPANY 22
Agency: Lauesen and Solomon
BUCKEYE PRODUCTS COMPANY 84
Agency: Associated Advertising Agency

CHEMICAL CORPORATION, THE 68
Agency: William B. Remington, Inc.
CODMAN, F. L. & J. C., COMPANY 83
Agency: Sanderson Brothers
COLUMBIA ELECTRIC MANUFACTURING CO. 18
Agency: Meermans, Inc.
COWLES CHEMICAL COMPANY, THE 11
Agency: The Bayless-Kerr Company

DARCO CORPORATION 25
Agency: The Aitkin-Kynett Company
DETREX CORPORATION 12
Agency: Charles M. Gray and Associates
DIVERSEY CORPORATION, THE 27
Agency: Cruttenden and Eger Advertising Agency

EDMONT MANUFACTURING COMPANY 102
Agency: Gerst Advertising Agency
ENTHONE, INCORPORATED 3
Agency: Peck Brothers

FIBER CHEMICAL CORPORATION 79

GENERAL CHEMICAL DIV., ALLIED CHEMICAL & DYE CORPORATION 32
Agency: Atherton and Currier, Inc.
GREEN, W., ELECTRIC COMPANY, INC. 28
Agency: Shappe-Wilkes, Inc.
GUMM, FREDERICK, CHEMICAL CO., INC. ..... Second Cover

HAMMOND MACHINERY BUILDERS, INC. 66, 67
Agency: Crescent Advertising Agency
HANSON-VAN WINKLE-MUNNING CO. ..... Fourth Cover
Agency: O. S. Tyson & Company, Inc.
HARRISON AND COMPANY, INC. 26
HARSHAW CHEMICAL COMPANY, THE 81
HAY, JACOB, COMPANY 86
HOLLAND, J., & SONS, INC. 104
Agency: H. O. Gerngross and Company, Inc.
HULL, R. O., & COMPANY, INC. 13
Agency: Ralph M. French Advertising

INDUSTRIAL FILTER & PUMP MFG. CO. 15
Agency: The Advertising Corporation
INDUSTRIAL PRODUCTS COMPANY 72
Agency: The Stewart-Jordan Company

JACKSON BUFF CORPORATION 20-21
Agency: Edward Owen and Company

KOCOUR COMPANY 69
KUSHNER, JOSEPH B. 79
Agency: The Philip Ritter Co., Inc.

LAND, L. J., INC. 89
LASALCO, INCORPORATED 62
Agency: Charles W. Bolan, Advertising
LEA MANUFACTURING COMPANY 54-55
Agency: Sanger-Funnell, Inc.
L'HOMMEDIEU, CHARLES F., & SONS CO. 7

MAC DERMID, INCORPORATED. ..... Third Cover
Agency: Philips Webb Upham & Company, Inc.
MAGNUSON CHEMICAL COMPANY 6
Agency: Spooner and Kriegel
MAGNUSON PRODUCTS CORPORATION 70
Agency: George Wilfred Wright
MEAKER COMPANY, THE 17
Agency: The Advertising Corporation
MICHIGAN BUFF COMPANY 90
MICHIGAN CHROME & CHEMICAL CO. 64
Agency: Karl G. Behr Advertising Agency
MUNNING AND MUNNING COMPANY 68
Agency: Mercready, Handy and Van Denburgh
MUNRAY PRODUCTS, INC. 5
Agency: Howe Advertising

NATIONAL RACK COMPANY 73
NELSON CHEMICALS CORPORATION 98
Agency: Beckman and Beerbohm, Inc.
NEW ENGLAND BUFF COMPANY 94
NOBLES ENGINEERING & MFG. CO. 72

OAKITE PRODUCTS, INC. 72
Agency: Rickard & Company, Inc.
OPTIMUS EQUIPMENT COMPANY 19
Agency: Mercready, Handy and Van Denburgh

PARKER RUST PROOF COMPANY 76
Agency: Fred M. Randall Company
PETOSKEY MANUFACTURING COMPANY. 102
PRODUCTION MACHINE COMPANY 71
PROMAT DIVISION, POOR & COMPANY. 29
Agency: Spaulding Advertising Service

NELSON J. QUINN COMPANY 82
Agency: Wendt Advertising Agency

RICHARDSON-ALLEN CORPORATION 100
Agency: E. M. Freystadt Associates, Inc.

SARCO COMPANY, INC. 18
Agency: W. L. Towne Advertising
SEELEY, F. E., COMPANY, INC. 68
SIEFEN, J. J., COMPANY 14
Agency: Courtney-Kent Advertising
SPARKLER MANUFACTURING COMPANY. 26
Agency: Kreicker and Meloan, Inc.
STAINLESS STEEL CONTAINER COMPANY 23
STANDARD PLATING RACK COMPANY 70
STEEL CITY ELECTRIC COMPANY 102
Agency: George L. Kinter Advertising
STEVENS, FREDERIC B., INC. 30
Agency: Associated Business Counselors, Inc.
STORTS WELDING COMPANY, INC. 10
SULPHUR PRODUCTS COMPANY, INC. 77

TITEFLEX, INCORPORATED 85
Agency: Sykes Advertising, Inc.

UDYLITE CORPORATION, THE 64
Agency: Grant Advertising, Inc.

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Agency: N. W. Ayer & Son, Inc.

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Plating

January 1, 1949

Dear Reader:

P ≤ 1000w

The above "formula" has governed a recent editorial decision here at PLATING. For that formula is simply an expression of the old Chinese philosophy that one picture is equivalent to at least a thousand words.

Practical evidence of the application of this thought will be found in the pages of this very issue, as well as on the cover. To attempt to describe effectively the size of the chromium plating job on the 27-ton casting shown on the cover would obviously take a large number of words, whereas it is dramatically and instantly conveyed by the photo. To any reader with a plating and finishing background, some of the problems of precision plating this casting also make themselves apparent without a single written word!

The article, "Big Business", on industrial chromium plating included in this issue is known as a "picture presentation", since the meat of the article is conveyed by the photographs and the text matter is merely supplementary and explanatory in nature. This device will be recognized as the tool of modern journalism that has been popularized by such general magazines as "Life" and "Look".

The editors of PLATING hope to present its readers with a continuing series of enlightening and stimulating picture presentations of plating plants and plated products. Next month's letter on this page will give you more information on the subjects that will be featured in this pictorial series.

Sincerely,

Gustaf Soderberg

Editor.

Future Meetings

Chicago Branch, A. E. S. Annual Educational Session and Banquet in Stevens Hotel on January 15. Educational Session in Afternoon, Banquet in Evening.

Third National Materials Handling Show in Convention Hall, Philadelphia, on January 10–14.

Grand Rapids Branch, A. E. S. 11th Annual Educational Session and Dinner-Dance in Pantlind Hotel on January 29. Educational Session at 2:00 P. M., Dinner at 7:00 P. M.

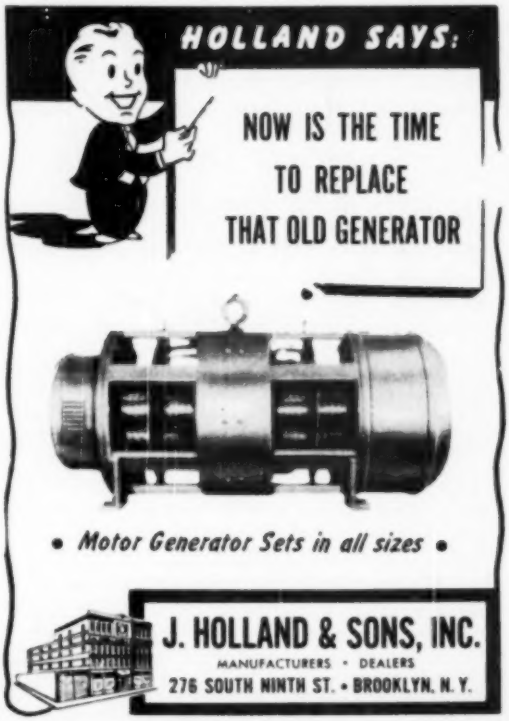
Dayton Branch, A. E. S. 4th Annual Educational Session and Dinner-Dance in Miami Hotel on February 12. Educational Session at 1:30 P. M., Dinner at 6:30 P. M.

A. S. T. M. Spring Meeting and Committee Week in Hotel Edgewater Beach, Chicago, on February 28 to March 4.

Boston Branch, A. E. S. 14th Annual Banquet and Technical Session in Hotel Statler on Saturday, April 16.

American Electroplaters' Society. Annual Convention in Hotel Schroeder, Milwaukee, Wis., on June 27 to 30, 1949.

A. S. T. M. Fifty-second Annual Meeting in Chalfonte-Haddon Hall, Atlantic City, N. J., on June 27 to July 1, 1949.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MACDERMID BRIGHT COPPER Shows how to obtain *mirror bright* deposits from cyanide solutions — 100% efficient.

ANODEX Reverse current cleaner for steel. The original smut remover — gives complete cleaning cycle and operating conditions.

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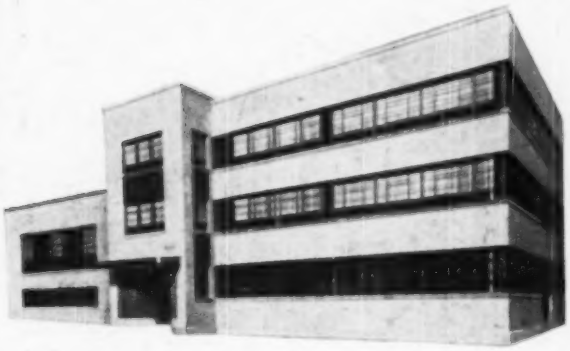

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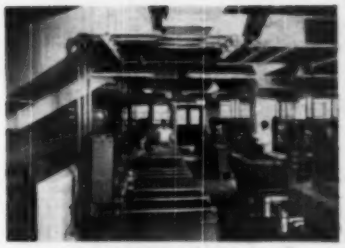

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